Environmental Studies Relative to Potential Sand Mining in the Vicinity of the City of Virginia Beach, Virginia

Part 1: Benthic Habitats and Biological Resources Off the Virginia Coast 1996 and 1997

Final Report

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Benthic habitats and biological resources off the Virginia coast 1996 and 1997

Introduction

The issues of coastline protection have become increasingly critical as erosion and coastal sediment transport have significantly altered or even eliminated ecologically and recreationally important coastal habitats. Increased public use of beaches, development of coastal lands, and preservation of the limited and sensitive coastal ecosystems have all lead to the need for beach nourishment as a means of stabilization and protection. The sand resources suitable for economical beach nourishment are usually located in the near shore coastal zones adjacent to the project areas. However, ongoing and planned beach nourishment activities along the coast of Virginia required sands from federal waters beyond the three mile line. The U. S. Mineral Management Service controls these sand resources and formed Cooperative Agreement (# 14-35-001-30807), "Environmental Studies Relative to Potential Sand Mining in the Vicinity of the City of Virginia Beach, Virginia" with the Virginia Institute of Marine Science and Old Dominion University in order to assess impacts of sandmining. Task 1 of this Cooperative Agreement ("Benthic Habitat Mapping and Evaluation of Existing Benthic Resources") involved benthic surveys of the region conducted by V. I. M. S. using sediment profile imaging and bottom grab samples.

Environmental concerns which arise in connection with proposals to excavate or mine sand from those areas identified as suitable for beach nourishment focus on potential ecological impacts associated either directly or indirectly with:

1. Removal or dredging of the sand from near coastal areas

2. Placement of the sand on the beach.

The configuration and location of the borrow site and the methods of handling the dredged material can be an important determinant in the level of impact. The level of potential impact would vary as a function of the characteristics of the material to be dredged, the exposure to currents and wave action, and the benthic resources (Thompson, 1973; Tuberville and March 1982; Hobbs, et al. 1985; Schaffner and Hobbs, 1992). Of the two geographic areas of concern associated with any beach-nourishment project, the source or borrow area and the beach area being nourished, we are focusing on the offshore source or borrow sites. In particular, the three sites off of Virginia Beach (Fig. 1) that will be used to nourish Virginia coastal beaches will be studied as a model project for evaluating environmental concerns.

Benthic habitats and non-commercial biological communities offshore Virginia were surveyed 1996 and 1997 in the vicinity of potential sandmining activities, where borrow areas had been identified and in regions of possible future interest . Benthic surveys were conducted semi-annually, during which sediment profile imaging (SPI) and standard bottom photographic camera systems and Smith-MacIntyre grabs were deployed.

SPI and standard photographs allow relatively rapid determination and assessment of benthic habitat characteristics and capability for broad areal sampling coverage. Grabs allow detailed determination of benthic biological community characteristics. Together, SPI and grab sampling provide complementary data which are capable of forming the basis for resource maps. Grab data may serve as the basis for confirming inferences made about biological and physical habitat characteristics using SPI data, and SPI data may be used to produce habitat coverage maps which should represent the potential limits of biological community manifestations.

SPI and grab data allow mapping of substrate types, biological community characteristics and functional aspects of the communities, delineation of habitat spaces, and determination of spatial heterogeneity of habitats and resources (Bonsdorff et al., 1996). Spatial and temporal patterns of habitats and community characteristics and the local and regional water flow patterns determine benthic community response to disturbance events such as sandmining, and therefore are important to the activities proposed off Virginia. This study provides determinations of benthic habitat types, spatial extent of substrate properties and habitats, benthic secondary production and biological community characteristics off the Virginia coast in and around areas where sandmining is proposed.

Study Area

The study area offshore Virginia extended from just inside the three-mile line to approximately 10 miles offshore, and from the latitude of the southern shore of Chesapeake Bay mouth (36.925° N) to a few miles south of Sandbridge, VA (36.675° N) (**Figures** 1 and 2). Within this broad region, smaller regions of interest were sampled at higher spatial densities during spring and fall 1996 and fall 1997 (**Figure** 2). Spring and fall 1996 sampling was done using three sample grids, one off Virginia Beach (northwest grid), one to the northeast of that (northeast grid) off the Chesapeake Bay mouth, and one off Sandbridge (southern or Sandbridge grid) (**Figure** 3: SPI, and **Figures** 4- 5: grab). The entire region was sampled at lower spatial density during the spring 1997 deployment. The 1996 study areas covered approximately 30 NM^2, the spring 1997 study area covered approximately 60 NM^2, and the fall 1997 study area covered approximately 10 NM^2. The fall 1997 deployment involved a very high density sample coverage in the vicinity of Sandbridge shoal and the proposed borrow areas (**Table** 1).

Previous descriptions of the study region include geological and geotechnical descriptions of the Virginia inner continental shelf have been done by Williams (1987) Berquist and Hobbs (1988); Kimball and Dame (1989); and biological descriptions by Ranasinghe, et al. (1985), and Dauer (1981). The study areas generally encompassed various sand substrates typical of the inner continental shelf, and substrates composed of finer grain-size materials delivered to the shelf by the Chesapeake Bay excurrent plume.

Methods

Sediment Profile Imagery (SPI) and Smith-MacIntyre grabs sampling

Spatial mapping of benthic habitats was accomplished using sediment profile imaging and standard bottom photography. Three different spatial supports for the data were utilized. During 1996, three study grids were defined and divided into cells which were approximately 0.2 NM on a side. One grid extended offshore Virginia Beach and Dam Neck and was composed of 200 cells (numbered 1 - 200), one grid composed of 100 cells was located to the northeast of the Virginia Beach grid, and cells were numbered 201 - 300, and one grid was located offshore Sandbridge, in the vicinity of Sandbridge shoal and was composed of 100 cells (numbered 301 - 400) (**Figures** 3 - 4). The prefix 96 was prepended to station numbers from 1996 (96001 - 96400) for presentation of the SPI data to provide consistency with the spring 1997 sample labels (**Figures** 3 - 5, and **Table** 1). Cells called 1 - 400 from spring and fall 1996 are synonymous with cells 96001 - 96400. Although it was unfeasible to revisit the exact point sampled upon subsequent sampling, revisited sample site numbers were maintained and positions recorded. Standard deviations of positions between seasons or years at a given sample site typically were on the order of 0.0005 degree latitude or longitude.

Grids were located in regions where sandmining activities were either planned (Sandbridge shoal area) or likely because of nearby localities (Virginia Beach, VA). Grids were composed of regularly spaced cell rows whose nearshore boundaries paralleled the Virginia Coast. Ten cells were defined for each cell row west to east across each 1996 grid. Because of the shape and arrangement of the grids, 1996 SPI samples were separated east to west neighbor by approximately 0.4 NM, northwest to southeast neighbor by approximately 0.25 NM, and northeast to southwest neighbor by approximately 0.2 NM.

The spring 1996 sampling cruise began May 14, 1996 upon the R/V Bay Eagle (V.I.M.S) and was halted by weather May 15, 1996. Completion of the spring 1996 sampling effort occurred aboard the R/V Bay Eagle (V.I.M.S), June 4 - 7, 1996. The fall 1996 cruise began October 21-22 aboard the R/V Langley (V.I.M.S) and November 4 - 6, 1996 aboard the R/V Bay Eagle.

A broadly spaced sample coverage was implemented for the spring 1997 deployment. A single staggered grid extending from Cape Henry to south of Sandbridge, Virginia was divided into grid cells measuring 1 NM per side. SPI samples were taken at each grid cell centroid (**Figure** 6), and grab samples were taken at a random subset of the stations, in addition to revisited locations sampled 1996 (**Figure** 7). Several stations from the 1996 survey were revisited during the spring 1997 deployment, and SPI and grab samples were taken. The spring 1997 cruise occurred June 16 - 19, 1997 aboard the R/V Bay Eagle.

Fall 1997 sampling was concentrated on the proposed borrow areas in the vicinity of Sandbridge shoal. Borrow Areas A to the south and B to the north coincided with the crest of Sandbridge shoal (**Figure** 8). SPI samples were taken at six stations from eight north to south transects crossing or nearby Borrow Area A, and from several points along three transects which crossed into Borrow Area B perpendicular to each of the sides defining B (**Figure** 9). Grab samples were taken at a random subset of the stations, in addition to revisited locations sampled 1996 and spring 1997 (**Figure** 10). Fall 1997 sampling occurred October 6 and 7, 1997 aboard the R/V Bay Eagle. **Table** 1 lists all positions (in decimal degrees latitude and longitude) occupied during sampling and the type of sample acquired during the two year study, and **Table** 2 lists coordinates for the corners of the proposed borrow areas off Sandbridge. All samples taken in the vicinity of the proposed borrow areas 1996 and 1997 are labeled, along with the boundaries of the borrow areas, in **Figure** 11.

SPI samples were taken at points defining by the centroids of grid cells. SPI samples were taken at every other cell centroid point and were staggered from row to row, odd numbered cells visited one row, even numbered cells the next. At each station (grid cell centroid), the SPI camera system was deployed twice. If there was uncertainty about camera function or success, additional drops were made. During the spring 1996 cruise a Benthos model 3731 sediment profiling camera was used until it malfunctioned. From then on and throughout the next three cruises, a Hulcher model Minnie sediment profiling camera was used attached to a Benthos stainless steel frame. After deployment, depth of prism penetration and frame count was recorded. Camera tests were done periodically to ensure proper function. 350 pounds of lead and steel were used to weight the camera prism during May 14 and 15, and 450 pounds of lead and steel were used for all of the subsequent deployments. Color slide film (Fujichrome 100 professional) was used in the cameras.

Smith-MacIntyre grabs were taken from randomly selected cells from each grid, following a stratified random sampling design. 150 pounds of lead were used to weight the grab in order to produce consistently deep bites into the bottom. Grabs were only accepted if over half the volume of the grab was filled with sediment and the sediment surface was preserved intact. Grab success rate was high, confounded only when large gravel or intact shells wedged the grab jaws open. The sediment surface of these inner shelf sands and muds was preserved very well by the grab.

The top millimeter of sediment in grab samples from spring and fall 1996 were scraped off using a flat blade, and stained and refrigerated for analysis of living foraminifera and ostracoda (Cronin, et al. 1998). Subcores (circular 10 cm diameter and 10 to 15 cm deep) were also taken from 1996 grab samples, and preserved in formalin for later analysis of meiofaunal and macrofaunal communities. The rest of the volume from 1996 grab samples and all the volume from 1997 grab samples were washed upon 500 μm sieves aboard the vessel just after they were collected. Residue upon each sieve was stored in a cloth bag and preserved in 10% formalin solution and contained in 5 gal. buckets for transport to the laboratory.

Laboratory processing and analyses

Sediment profile images were analyzed by visual counts and measures of sedimentary and biogenic features in images projected upon a calibrated grid. Measurements were made of SPI prism penetration depth (PEN), average depth of the apparent color redox potential discontinuity (RPD), sediment surface relief (Sed. Rel.), relief type, sediment type, epifaunal presence and type, presence of tubes at the sediment-water interface, amount of biogenic shell material present; number, type and depth of infauna visible; number, depth and type of water filled infaunal feeding voids present (whether surrounded by anoxic or oxidized sediments); number and depth of gas voids present; and number and type of infaunal burrow structures present (**Tables** 3 - 6). Notes were also made concerning any unusual features encountered during SPI analysis. Details on analyses and more extensive description of SPI parameters may be found in Rhoads and Germano (1982) and in Diaz and Schaffner (1988).

SPI parameter determination and delineation of habitats have been shown effective and comparable to sediment core sample data habitat delineation (Bonsdorff, et al., 1996) when samples have come from widely varying habitats and distinct geomorphic regions. Mapping the individual SPI parameters as well as biological community characteristics and production for this study was done for the inner shelf, allowing comparisons of SPI - grab delineation capabilities within a relatively uniform geomorphologic region. For habitat mapping, SPI feature types were designated biological or physical if features from either origin composed most of the SPI image. If both feature types were present in approximately equal amounts, feature type was designated combination.

In the laboratory, grab samples were processed to obtain secondary production estimates and organismal densities and biomasses. Organisms were sorted into major taxa and enumerated. Samples which retained a large amount of sand which would not pass through 500 µm sieves were elutriated and the organisms then extracted for sorting. Processing for secondary production calculations involved resieving the sorted taxa through a series of sieve sizes (6.3, 3.35, 2.0, 1.0, and 0.5 mm), then counting and weighing the organisms in each size fraction. Counts and biomass were converted to m^{-2} by multiplying by 11.1.

Production was calculated using the technique described in Brey (1990). Total wet weight per sample taxa per size class was converted to mean individual weight per size class using the number of individuals counted. Wet weights were converted to ash-free dry weights (AFDW) using the conversion factor of Waters (1977):

AFDW (g) = Wet Weight (g) * 0.152.

Combined weights from all size classes allowed determination of biomass and production for each taxa per sample. Mean individual weight and total biomass per square meter for each major taxa and size fraction allowed estimation of secondary production using the multiple regression models of Brey (1990) including different coefficients for each taxa. When very small biomasses were present, production estimates were unrealistically high due to the limited range for which Brey's (1990) model applies. Therefore if mean annual biomass was estimated to be less than 0.02 g m^2, the value was excluded and production was not calculated for that observation. Production estimates reported are from 1996. Calculation of production for 1997 is in progress.

Maps

Maps representative of SPI parameters, habitat types, and biological densities and secondary production estimates were produced using the SPI and grab data. For each parameter mapped, the legends are consistent between maps from different sample dates, easing comparison. Interpolation and contouring of SPI and grab data was done by an inverse distance weighted (IDW) squared, nearest 12 neighbor method using Arcview for Windows NT. For habitat maps, the IDW squared method was used, but with only one neighbor to prevent generation of apparent intermediate habitat classes by interpolation.

Results

SPI analysis

SPI analyses data for spring and fall 1996 and spring and fall 1997 sampling efforts are presented in **Tables** 3 to 6. Maps constructed using these data are addressed hereon. While most parameters for 1997 were not plotted as maps, the data are available in **Tables** 5 and 6. SPI prism penetration patterns were similar between the seasons and years. Deepest penetration depths occurred in the northwestern part of the study area. Shallowest penetrations occurred in the northeastern part of the study area. Patches of shallow penetration were observed in the vicinity of Sandbridge shoal, and patches of deep penetration were observed just to the east and west of the shoal (**Figure**s 12 - 14). Spring 1996 SPI prism penetration depth ranged from < 5 to > 20 cm. Deepest penetrations (>10 to 20 cm) in the spring of 1996 were in the northwest portion of the study area (**Figure** 12). Fall 1996 penetration was also deepest in the northwest part of the study region, some exceeding 20 cm (**Figure** 13), and also in parts of the study area off Sandbridge. Spring 1997 sampling revealed a similar pattern, with deep penetration in the northwest, shallow penetration in the northeast, and patches of deep and shallow penetration off Sandbridge (**Figure** 14). SPI prism penetration within the proposed borrow areas ranged was generally within the 5 to 10 cm range (**Figure**s 13 and 14).

Sediment-water interface (SWI) relief (surface relief) ranged from < 1 to 10 cm from spring 1996 through spring 1997 (**Figure**s 15 - 17). Lowest relief (smoothest surfaces) was observed in the study area off Sandbridge, just inshore from Sandbridge shoal and the proposed borrow areas, and in the northeastern part of the study area, as well as in patches within the study region off Virginia Beach. Highest sediment-water interface relief was observed in the northwest portion of the study area and off Sandbridge within borrow area A (**Figure** 16). Most of the images in the study area from spring and fall 1996 and spring 1997 revealed SWI relief of 1 to 2 cm. The area between the northwest and northeast parts of the 1996 study area was interpolated to have relief from 1 to 2 cm using spring 1996 data, and 2 to 4 cm using fall 1996 data (**Figure**s 15 - 16). The points sampled spring 1996 and 1997 within this zone revealed lower relief (< 1 cm) suggesting that the high relief observed from cell 281 fall 1996 was a temporary artifact.

The apparent color redox potential discontinuity (RPD) layer depth ranged from < 1 to > 10 cm during spring and fall 1996 (**Figure**s 18 - 19). RPD depth measurements from 1997 samples has not yet been completed. Spring 1996 sampling revealed a large area off Virginia Beach and a point within borrow area B with RPD depths of 5 to 10 cm. In the northeastern part of the study area, RPD depths were nearly all between 1 to 3 cm. Shallowest RPD depths were observed off Sandbridge, just inshore of Sandbridge shoal and the proposed borrow areas (**Figure** 18). Fall 1996 sampling revealed slightly lower RPD depths in the northwestern part of the study area, off Virginia Beach, and similar RPD depths in the northeast. RPD depths in the study area off Sandbridge were deepest fall 1996, most between 5 to 10 cm and one > 10 cm (**Figure** 19).

Infaunal tubes were present in many of the SPI images during spring 1996, with highest numbers of tubes in the northwestern part of the study area (> 25), and very few in most of the northeastern-most part of the study area (**Figure** 20), except at a few stations where there were high numbers (10 to 25). Spring 1997 SPI images revealed lower numbers of tubes over most of the study area. Most of the images had no tubes visible at the sediment-water interface (**Figure** 21). There were some tubes visible in images from the northwestern part of the 1997 study area, as seen also in spring 1996. However, the high numbers observed in the northwestern part of the 1996 study area were not apparent in spring 1997 images. The absence of tubes in numbers > 25 per SPI image from spring 1997 may indicate changes in community composition or limited spatial patches dominated by tube-dwelling infauna, perhaps not as extensive in coverage as suggested by the interpolation displayed in **Figure** 20. Most of the tube building infauna were polychaetes, from the families Maldanidae (*Clymenella, Asychis, Euclymene, Maldanopsis*), Ampharetidae (*Asabellides oculata*), or Onuphidae (*Diopatra cuprea*). Species were confirmed by grab samples, but tube structures were usually distinct enough to discern tube types in SPI images. Grab samples produced many other species as well which were not detected in SPI images (See section on grab sample analysis below).

Sediment types in the study region were primarily sands from -1 to 4 phi, but some muds (4 to 8 phi) were also present. Muds were prevalent in the northwestern part of the study area and in patches across the region (**Figure** 22). The muds were typically silt to clayey silt, and sands ranged from very fine sands to coarse sands and granule (**Figure** 23). Fine sands (2 to 3 phi) were most common throughout the study area. The spring 1997 sampling grid did not encounter as many silty sediment patches as the 1996 sampling. Sediment grain size and alkalinity determined from spring 1997 grab samples are listed in **Table** 7.

Habitats classifications from SPI images

The variety of sediment types and habitat types were apparent in images from spring and fall 1996 when more dense sampling grids were employed. Nine gross habitat classes were identified from a set of sixteen habitats initially identified using 1996 SPI images. Habitat classes were labeled A - I, and are summarized in **Table** 8. SPI images representative of the nine habitat types are displayed in **Figure**s 24 - 32. Habitat determinations from 1997 data are not yet complete. Habitat maps made using the nine habitat type classes reveal the diversity of bottom types across the study area encountered spring 1996 (**Figure** 33) and fall 1996 (**Figure** 34).

Seven of the habitat types were identified in SPI images from spring 1996. The most common and extensive habitat types spring and fall 1996 were (class C) silty-sand to very fine sand sediments with both biological and physical characteristics, and (class D) fine sand sediments with primarily physical features (**Figure** 26). Overall, across the entire study region, 73 of the 157 cells from which determinations were made using SPI images from spring 1996 were habitat class C, and 31 were class D. Eight of the nine habitat types were identified from fall 1996 SPI images. For the entire study region, 100 of 191 cells revealed habitat class C, 39 were class D, and 28 were class F (**Table** 9). The entire grid block in the northeastern part of the study area (cells 96201 - 96300) was found to have only habitat class C (combined biological and physical fine sands) spring and fall 1996 (**Figures** 33 - 34).

Biologically dominated silts (class A) and fine sands (class E) were also present across much of the study area, though slightly fewer during fall 1996 sampling than spring 1996. Physically dominated silt sediment habitats (class B) were present only during fall 1996 at three stations off Virginia Beach. Physically dominated medium sand and shell sediments (class F) were present most in the study area off Sandbridge, and were more extensive fall 1996. Biologically dominated medium sand and shell sediment habitats (class G) were apparent at some of the sample stations off Sandbridge, just outside the proposed borrow areas, and also at several stations in the study area off Virginia Beach. Physically dominated coarse sands to gravel sediments (class H) were encountered only off Sandbridge, just inshore of the proposed borrow areas spring and fall 1996, and at one station off Virginia Beach spring 1996. Apparently transitional substrates, composed of coarser grain-size sediments layered over finer grain-size sediments (class I) were encountered fall 1997 at three stations off Virginia Beach, and at one station off Sandbridge (**Figure**s 33 - 34).

Grouping the habitats in terms of dominance by biological or physical features, or combined interaction of biological and physical features, without respect to sediment type reveals broad and apparently continuous regions of either physically or biologically dominated substrates spring 1996 (**Figure** 35). During spring 1996, biologically dominated habitats were prevalent in the northwestern part of the study area off Virginia Beach, physically dominated habitats are prevalent in the vicinity of the proposed borrow areas off Sandbridge, and combination habitats were interspersed in those two regions and ubiquitous in the northeastern part of the study area (**Figure** 35). Similarly, fall 1996 SPI images revealed biologically dominated habitats in the northwest part of the study area and in the study area off Sandbridge, however in apparently non-continuous, smaller patches than during spring 1996 (**Figure** 36). Habitats with combined biological and physical interaction were present in the study areas off Virginia Beach and Sandbridge and pervasive across the northeastern grid. **Table** 10 lists positions, cell numbers and habitat classifications.

Of the seven habitat types identified using SPI images in the northwest sample grid off Virginia Beach spring and fall 1996, four were biologically dominated or combination biological/physical substrates, and three were biologically dominated or combination during fall 1996. In the northeastern sample grid 1996, only one habitat type was identified during spring or fall, and that had combination biological and physical features. In the sample grid off Sandbridge, five habitats were identified spring 1996, and of those two were biologically dominated or combination. Similarly, in fall 1996, in the sample grid off Sandbridge, two of seven habitats identified were biologically dominated or combination.

Secondary production

Total benthic secondary production calculated using the technique of Brey (1990) ranged from < 1 g m^{-2} yr^{-1} to > 50 g m^{-2} yr^{-1} (**Figure** 37). Low (< 5 g m^{-2} yr^{-1}) to high (> 25 g m^{-2} yr^{-1}) production was observed in the northwestern part of the 1996 study area off Virginia Beach. Low to moderate (5 to 25 g m^{-2} yr^{-1}) production was found in the northeastern sample grid and in the study area off Sandbridge in the vicinity of the proposed borrow areas. The high total production values correspond to high combined production by molluscs (**Figure** 38), and annelids (**Figure** 39), and to a lesser degree by crustaceans (**Figure** 40). Mollusc production was high at one site in the northwestern sample grid off Virginia Beach, and low to moderate throughout the rest of the study area (**Figure** 38). Annelid production was high at a site just west of where mollusc production was highest, in the central part of the northwestern sample grid off Virginia Beach, and was low to moderate elsewhere (**Figure** 39). Crustacean production was low throughout the study area , but relatively higher in the northwest sample grid and at one site in the study area off Sandbridge, within proposed borrow area B (**Figure** 40). Miscellaneous taxa, composed primarily of echinoderms and cnidarians, had very low production across the area. However, some patches of relatively higher production by miscellaneous taxa corresponded with higher production by molluscs, annelids and crustaceans (**Figure** 41).

Sandbridge study area analysis, including proposed borrow areas

Habitat types in the study area off Sandbridge were mostly physically dominated fine to medium sands along Sandbridge shoal crest in spring 1996 (**Figure** 42) and combination biological-physical silty sands or biologically dominated silts around the shoal. Habitats were similarly distributed fall 1996 (**Figure** 43) but slightly fewer biologically dominated muds were encountered, one sample revealed silt in part of borrow area A. Another site had sediments which had apparently undergone recent transition, with a coarser grain-size sediment layer overlain upon clayey silt (**Figure** 43). Both spring and fall 1996 SPI images reveal primarily physically dominated habitats throughout most of borrow area B, and approximately half of borrow area A (**Figures** 44 - 45). Biologically moderated habitats were found to the west (inshore), east, and south of the proposed borrow area (**Figures** 44 - 45).

Total community secondary production from 1996 within the study area off Sandbridge was low to moderate, and relatively highest in at one site near the southern boundary of borrow area A and to the west of borrow area A (**Figure** 46 with cell numbers labelled, and **Figure** 47). Production by molluscs was very low to low throughout the study area off Sandbridge, except at a station to the west where production was moderate (**Figure** 48). Polychaete production in the study area off Sandbridge was very low to low. Lowest polychaete production was found in borrow area B (**Figure** 49). Crustacean production was very low (< 1 g m^{-2} yr^{-1}) at all except three stations where production was low (1 - 5 g m^{-2} yr^{-1}) in the study area off Sandbridge, 1996 (**Figure** 50).

Total infaunal densities ranged from < 100 to > 2000 m^{-2} in the study area off Sandbridge. Highest overall densities (> 2000 m^{-2}) were found to the west and in the center of borrow area B (**Figure** 51). Lowest overall densities were observed in samples taken just to the south and west of the sample with high density in the center of borrow area B. Molluscs were found in highest densities at one cell to the west of the proposed borrow areas,. and were found in higher densities inshore of the borrow areas within the study area off Sandbridge (**Figure** 52). Polychaete densities were high inshore of the proposed borrow areas and at one cell in the center of borrow area B and one cell to the east of borrow area A (**Figure** 53). Crustacean densities in the study area off Sandbridge, 1996 were relatively high (> 1000 m^{-2}) in borrow area B, and low to moderate elsewhere (**Figure** 54). Comparisons of apparent general habitat type determined using SPI to benthic secondary production (**Figure** 55) and faunal densities (**Figure** 56) reveal that total community production and densities for all taxa agree fairly well with the habitat delineations made using SPI.

Grab sample analysis

Benthic Community Species Composition

At total of 119 taxa were identified from 13 of the Smith-MacIntrye grabs collected in 1996 (**Tables** 11 - 12). Half of the top 14 taxa in terms of occurance and abundance were polychaetes. The other half were one representitive each from the amphiods, decapods, bivalves, nemerteans, tanaids, echniderms, and chordates (**Table** 13). The distribution of species among the taxa was similar to other benthic studies from the region. **Table** 14 compares our study to that of Dauer (1981). While Dauer's data are for about 3.5 times as much bottom area as ours, the total numbers of species from both studies are close. Dauer's (1981) survey of the benthos at the proposed Norfolk District COE open water disposal site, about 15 miles East of the entrance to Chesapeake Bay is the closest historical data set to our study area. The Dauer study was at the same latitude as the northernmost extent of our study area, and about 8 miles to the east, but was at similar sediment types and depths.

Overall, the community composition within our study area was typical for sandy shallow continental shelf habitats. Detailed studies by Boesch (1979) off the coasts of New Jersey and Maryland, Maurer et al. (1976) off Delaware, and Day et al. (1971) off North Carolina reported simialar species composition for similiar depths and sediment types. While there were many differences in the species composition, several species and taxa were consistently reported by these studies, such as, *Spiophanes bombyx*, various *Nephtys* species, *Tellina agilis*, *Magelona rosea*, *Aricidea* spp., *Spio setosa*, *Nassarius trivittatus*, *Ampelicsa verrilli*, *Unciola irrorata*, and *Mellita quinquiesperforata*. All of these are know to be high salinity sand species.

Benthic Community Size Spectra

The size distribution of the benthos, both biomass and number of individuals, is an important factor in determining the potential food resources available to bottom feeding fish and crabs (Diaz and Schaffner 1990, Edgar 1990) and was the data used in calculation of secondary production. Size spectra of the benthos (Class intervals of 0.5 to 0.9, 1.0 to 1.9, 2.0 to 3.3, >6.3 mm) were determined from the grab samples and followed a pattern typical for marine communities, where the highest biomass was in the larger size classes and highest number of individuals was in the smaller size classses (**Figures** 57 - 58). Overall for June and November 1996 data, 15 % of all individuals and 81 % of the wet weight biomass were in the larger biomass size fractions, 3.35 and 6.3 mm size classes. The taxonomic composition of the larger biomass size fractions spanned a broad range with only the total biomass of anemones and amphipods being less than 50 % in the larger size fractions (**Table** 15). In terms of numbers, only echinoderms, bivalves, and chordates had 50 % or greater of their total abundance in the larger size fractions (**Table** 15).

Overall, total biomass about doubled between June to November, going from 4.1 to 7.7 g wet wt m^2 (**Table** 16). Annelids, the dominant taxonomic group in biomass, numbers and trophically, are typical of this trend and averaged about 13 g wet wt m^2 in June and 28 in November. The modal biomass size fraction for annelids in both June and November was 3.35 mm. Maldanid and Nephtid polychaetes were the predominant families that accounted for most of the 3.35 mm size fraction biomass.

Total abundance declined from June to November being 2350 and 1850 ind. m2, respectively. Again, annelids were typical of this trend declining from 960 to 910 ind. m2 with the modal size fraction being 1.0 mm (**Table** 16). This increase in biomass and decline in abundance are likely due to post settlement seasonal growth and mortality of macrofauna.

Discussion

Deep SPI prism penetrations in the northwestern portion of the study area coincided with the Chesapeake Bay plume deposits, composed of finer grain-size sediments. Deep prism penetration in other parts of the study area appeared to coincide with the depositional environments induced by large-scale bottom features such as Sandbridge shoal. The shoal consisted of coarsest sediments along the crest and was surrounded by a rim or at least patches of finer sediments, silts to clayey silts. Biological activity and numbers of macro-infaunal organisms and structures were high in these finer sediments, as apparent in the sediment profile images (**Figure** 45) and in the grab samples (**Figure** 51).

Relief was generally caused by sediment bedforms, primarily smooth-crested wave-orbital ripples. Bedform heights were observed to be 1 to 2 cm and as demonstrated by the surface relief, or SWI relief, measurements. Larger bedforms were observed in the study area off Sandbridge, within borrow area A, and in the northern part of the study region off Virginia Beach.

Habitat mapping using SPI and sediment grab sampling was very effective for covering large regions such as the study areas off Virginia Beach. Relative resource evaluations would then be made using parameters measured from SPI and grab samples. This is in contrast to indices, such as the organism-sediment index (OSI) (Rhoads and Germano 1982) which includes only certain SPI data, and benthic index of biotic integrity (B-IBI) (Weisberg, et al. 1997) derived only from grab data. Such indices are of questionable value for assessing resources over broad areas. The OSI, for instance, relies upon the RPD depth without considering the sediment type or grain size. RPD depth, however, may be influenced significantly by grain size. Thus OSI may be useful for comparing habitat properties within a relatively uniform sedimentary environment, but for comparison across sediment type regions, it is confounded by not accounting for collinearities in habitat parameters. Thus, interpretation of the SPI and grab data is necessary to provide a habitat resource value assessment, unless a new index is developed, or one is modified, which accounts for inter-regional parameter behavior.

Using only two parameters determined from SPI analysis, a rapid assessment of gross habitat type can be made. Using just an assessment of sediment grain size class (coarse to very fine sand, coarse to fine silt, and clay, and mixtures) and determination of prevalence of biological features or physical structures provides a simple method for initial delineation of benthic habitats. These may be further refined by determination of dominant fauna or surficial geological characteristics, both available using SPI data or inferences about features present in SPI images confirmed by grab data.

Benthic secondary production for 1996 was high (> 25 g m^{-2} yr^{-1}) in the northern portion of the northwest sample grid off Virginia Beach and low (< 5 g m^{-2} yr^{-1}) to moderate (5 - 25 g m^{-2} yr^{-1}) throughout the rest of the study area (**Figure** 37). In the northwest sample grid, off Virginia Beach, the high production calculated using grab sample data corresponded to regions which were identified using SPI images as biologically dominated fine sand during spring 1996 (**Figure** 33), but as physically dominated fine sand fall 1996 (**Figure** 34). Habitats were identified as physically dominated at some locations using SPI images, but relatively high production was found using grab data. In some sediments, especially non-cohesive sands, biological features may not persist, and fauna may be inconspicuous.

Therefore, dependent upon substrate characteristics, more or less effort with the different sampling techniques may be necessary. Accurate habitat mapping then may require initial reconaissance and subsequent allocation of sampling effort. Some habitat determinations using SPI may not have agreed with observed high or low production or biological densities because of small spatial-scale variabilities since grabs were not necessarily acquired on the exact spot where images were taken. General agreement is good between the two sampling techniques for gross characterizations of habitat and for biological resource assessment. The agreement between the interpolations made using SPI and grab sampling is encouraging, especially considering that each was done upon a different support, the sample spatial structure.

Discriminant analysis using SPI and grab data should reveal whether the habitat determinations convey objective discretions. Evaluation of the pertinence of the 1996 determinations will be used to delineate habitats using 1997 data. In general, if SPI can be used to reliably relate habitat characteristics which allow prediction of benthic community attributes, then statistical spatial models may be constructed for habitats and resources with efficiency. Refined SPI and grab sampling strategies may accomplish regional benthic resource assessment and mapping with a reasonable effort.

Where persistence of SPI features would be confounded by lack of sediment cohesivity, we expect that habitat delineations will underestimate community attribute variability. However, SPI and grab data and maps for the region off the Virginia coast elucidate an overall more complex benthic system than was expected based upon the generalized descriptions of previous studies for the inner continental shelf off Virginia.

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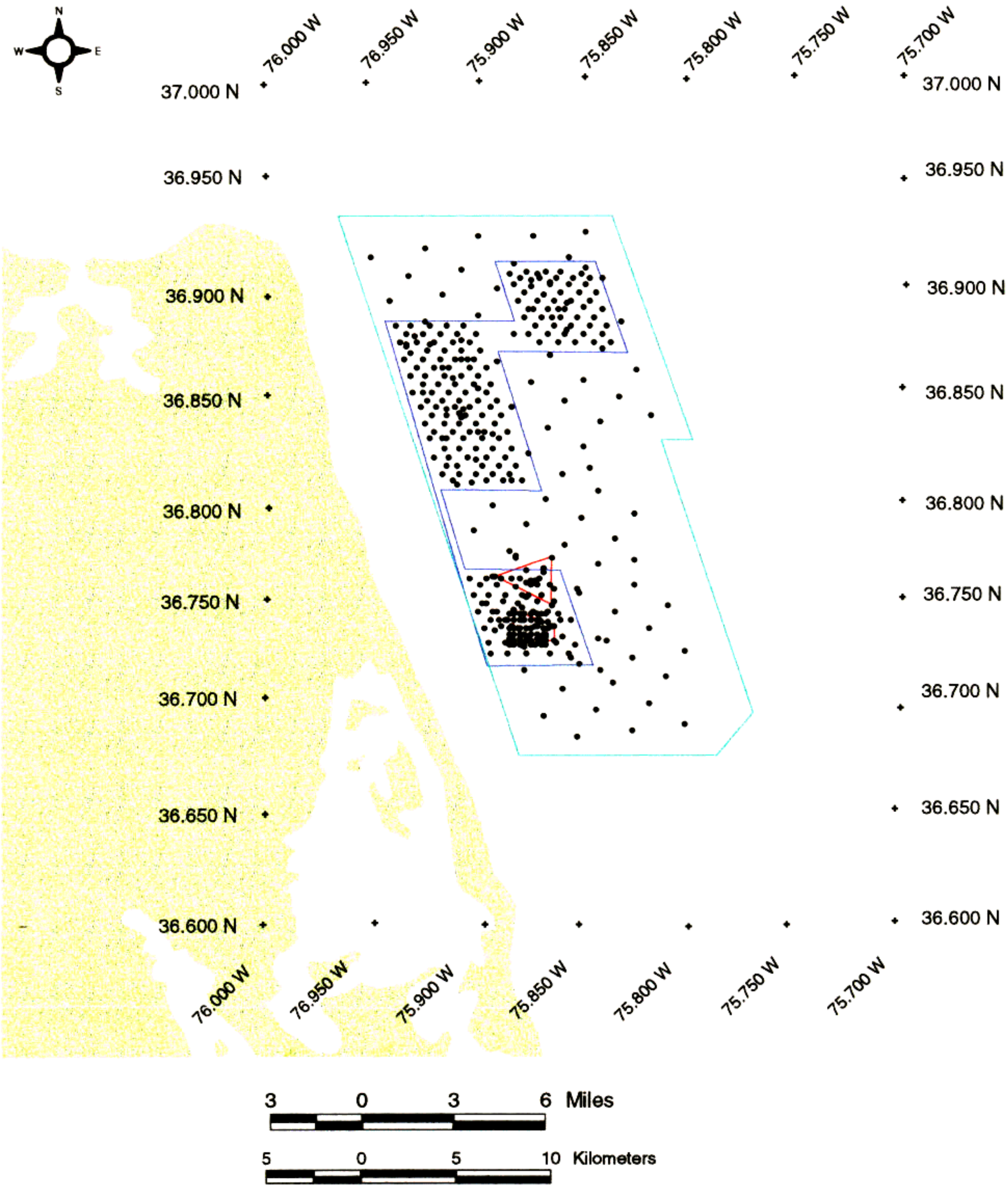


Figure 1. Benthic survey study areas off Virginia Beach 1996 and 1997 with reference grid listing latitude and longitude in decimal degrees.

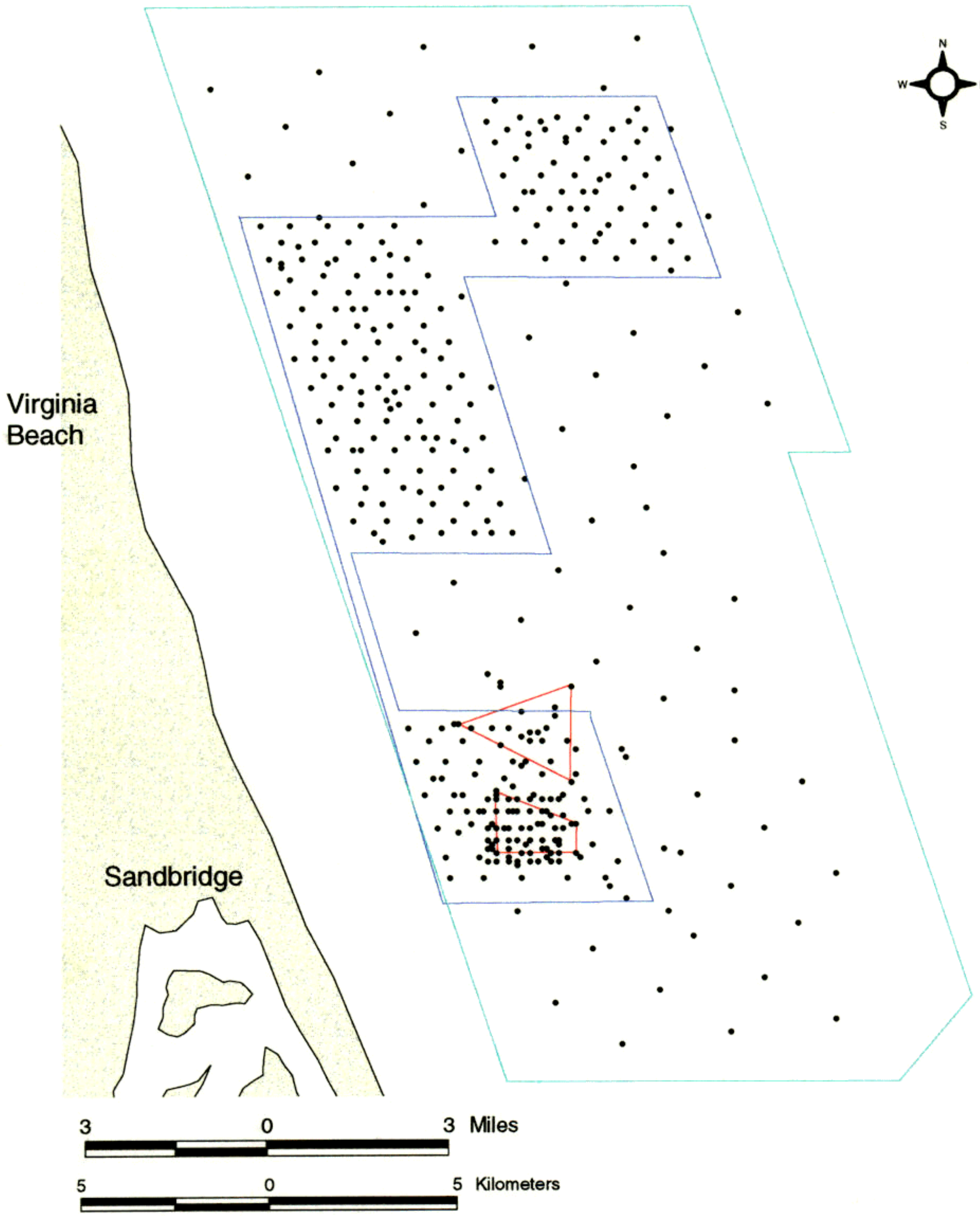


Figure 2. SPI and Smith-MacIntyre grab site locations off the Virginia coast, spring and fall 1996 and 1997. Red lines indicate proposed borrow areas A (southern) and B (northern) for sandmining, blue lines indicate limits of 1996 study region, and green lines indicate limits of 1997 study region.

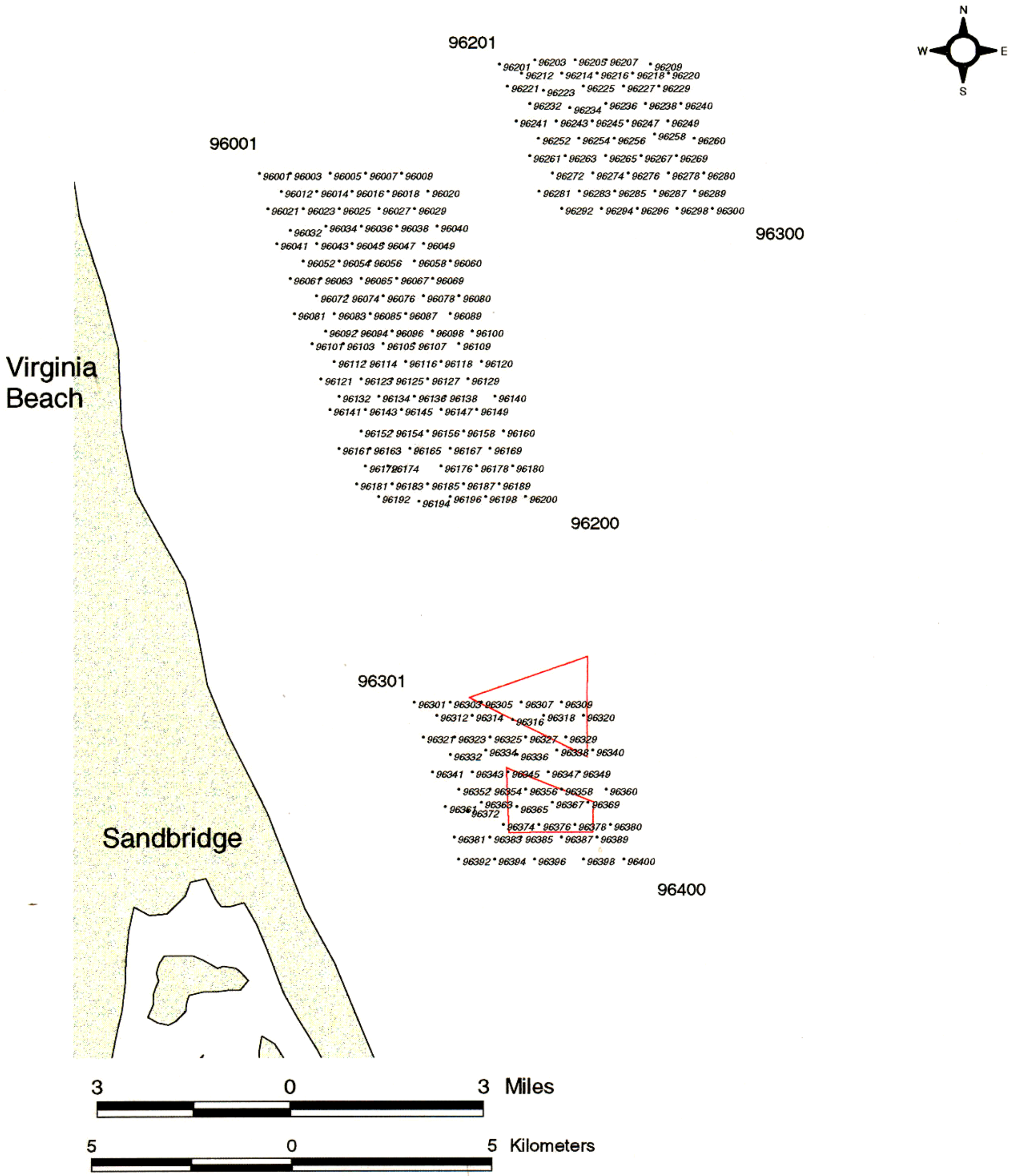


Figure 3. SPI sample site locations off the Virginia coast, spring and fall 1996.

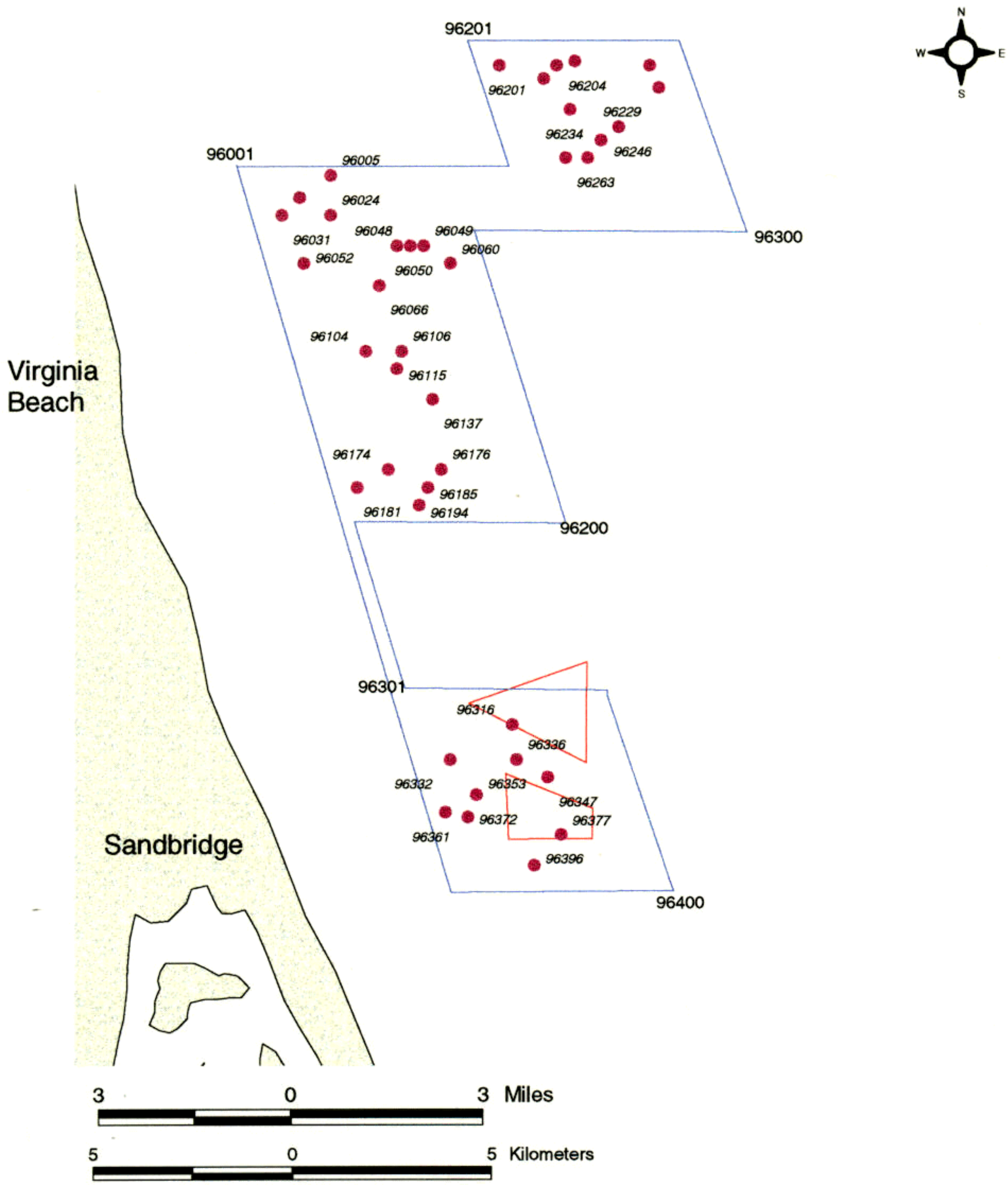


Figure 4. Smith-MacIntyre grab site locations off the Virginia coast, spring 1996.

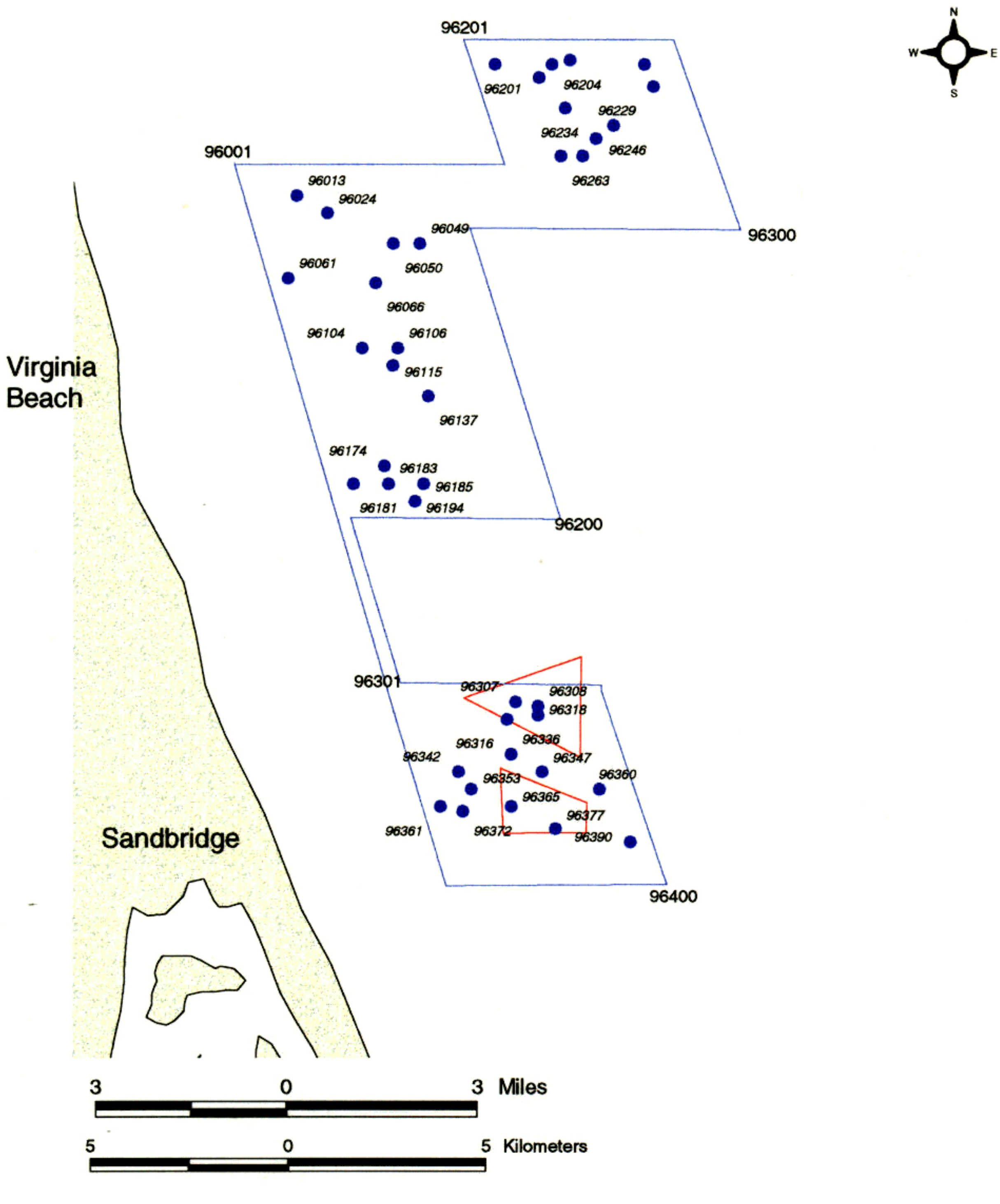


Figure 5. Smith-MacIntyre grab site locations off the Virginia coast, fall 1996.

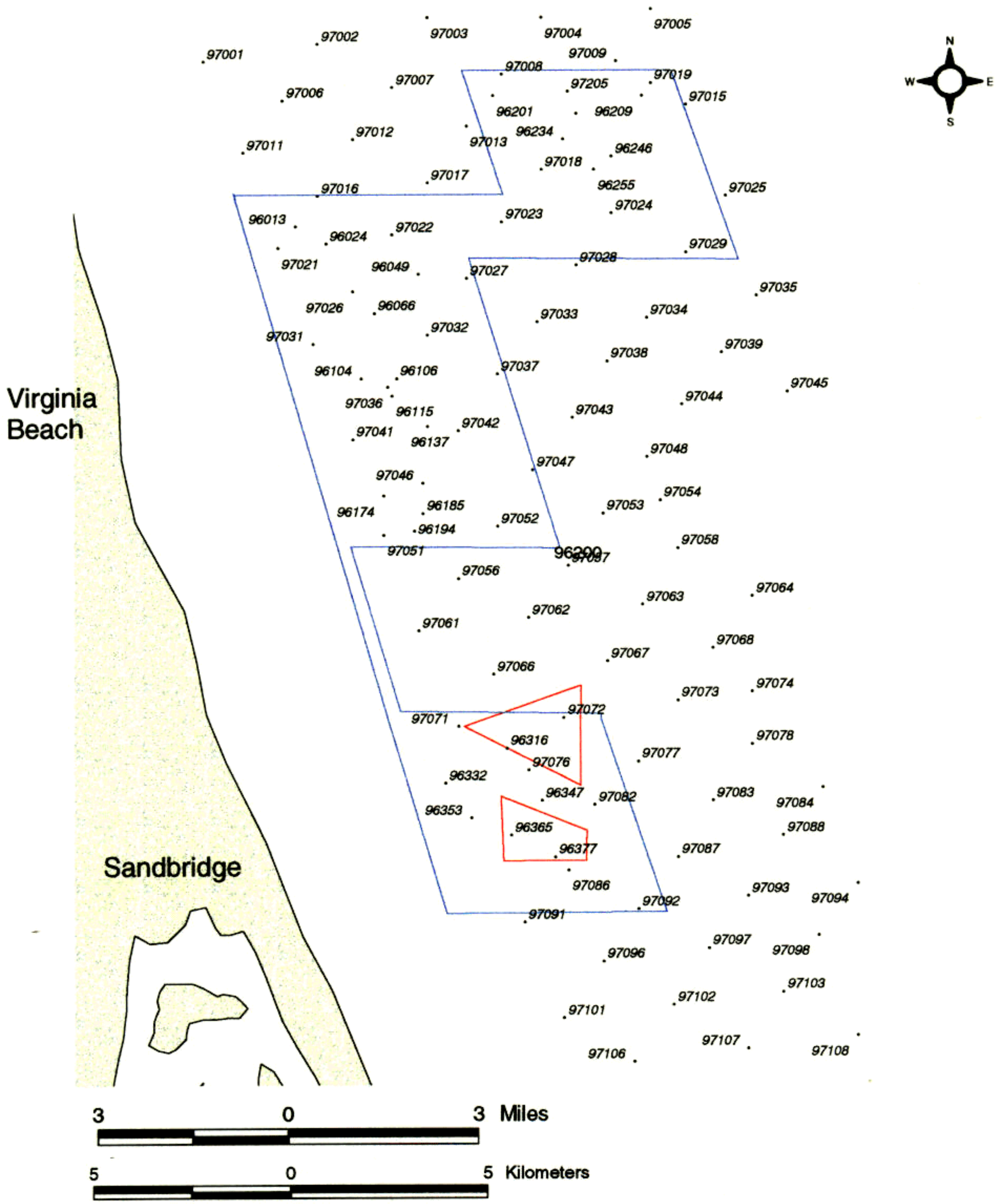


Figure 6. SPI sample site locations off the Virginia coast, spring 1997.

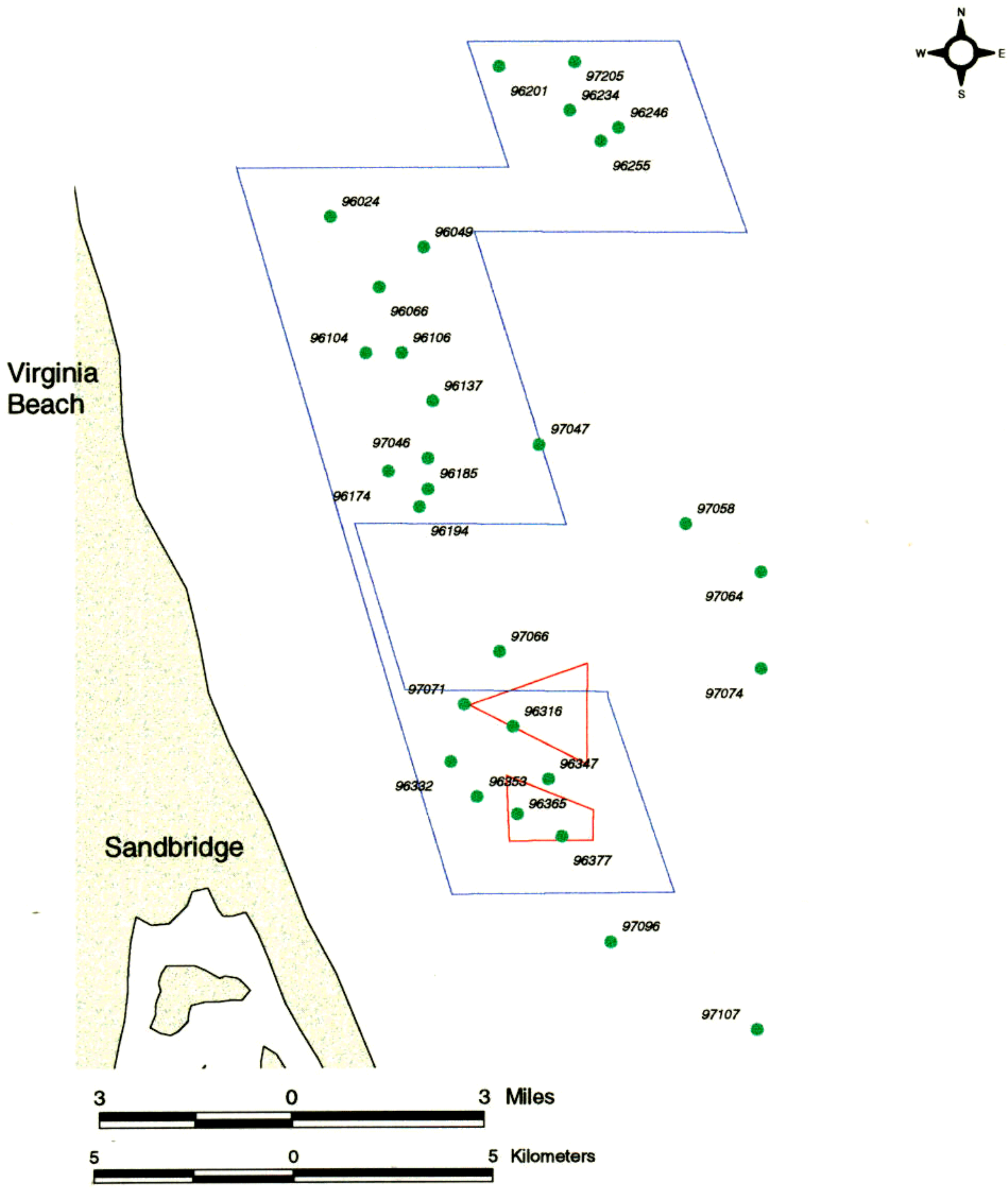


Figure 7. Smith-MacIntyre grab sample site locations off the Virginia coast, spring 1997.

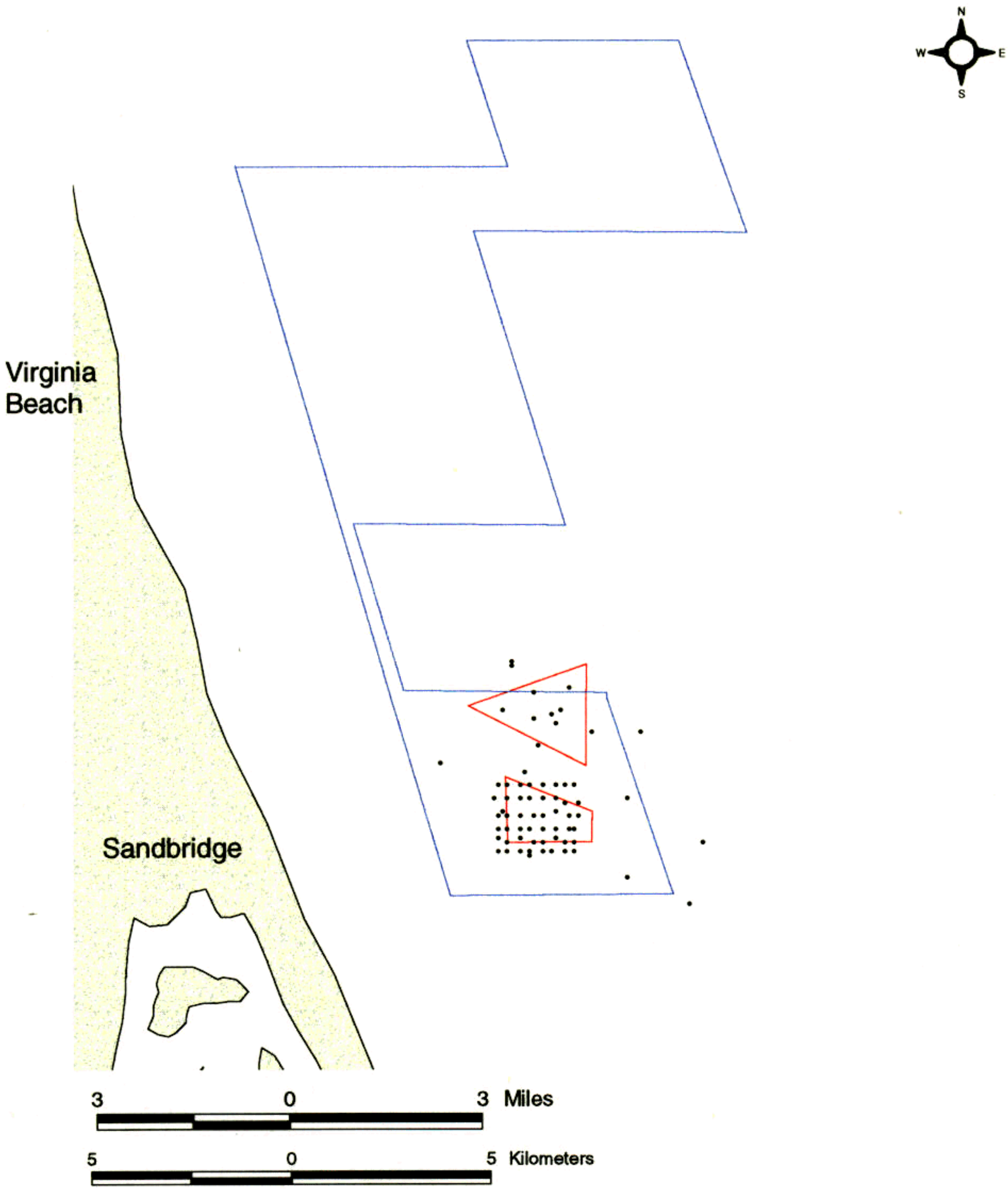


Figure 8. SPI and Smith-MacIntyre grab site locations off the Virginia coast, fall 1997 in the vicinity of Sandbridge shoal and the proposed borrow areas (red lines) for sandmining.

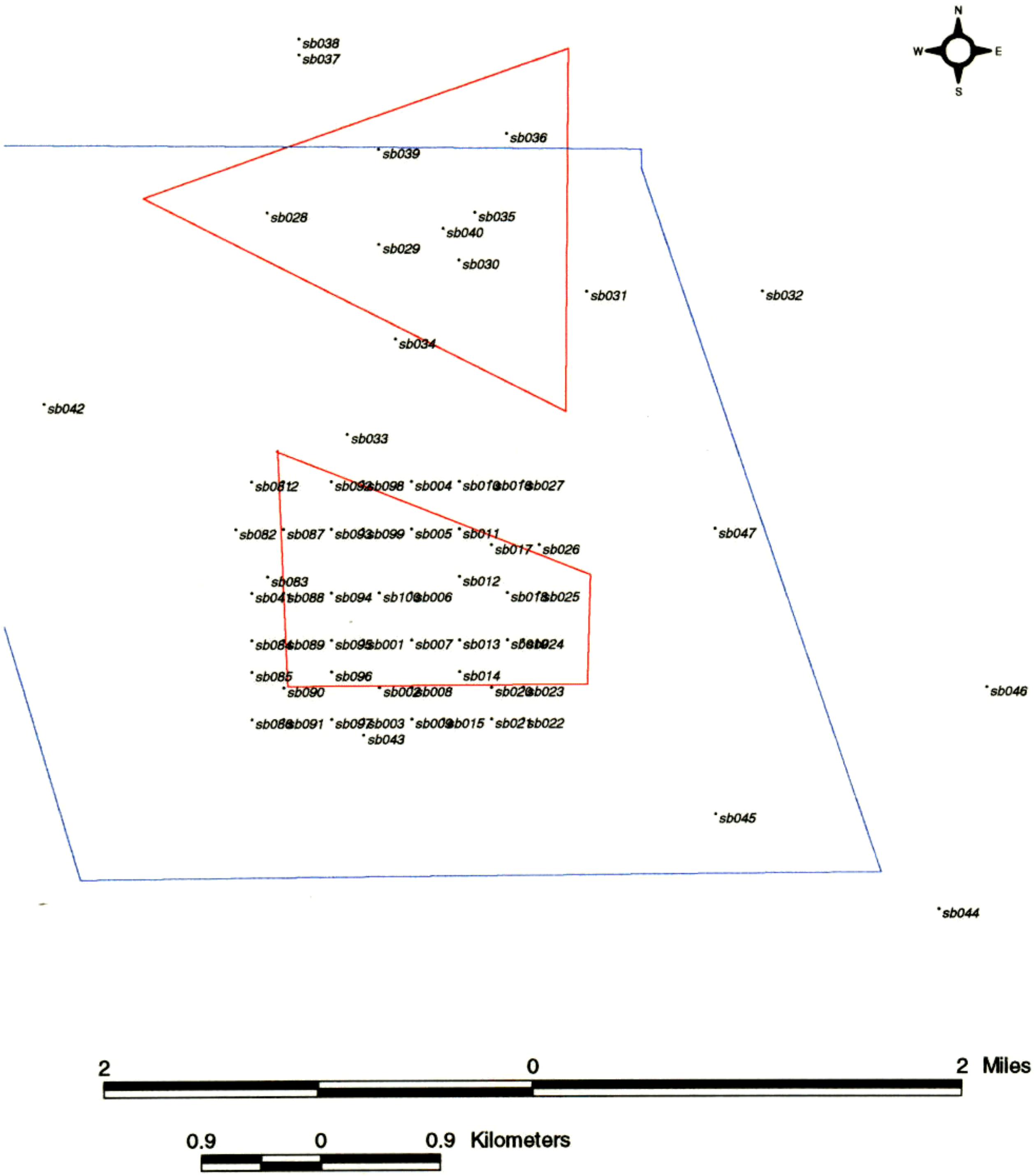


Figure 9. SPI sample site locations, fall 1997.

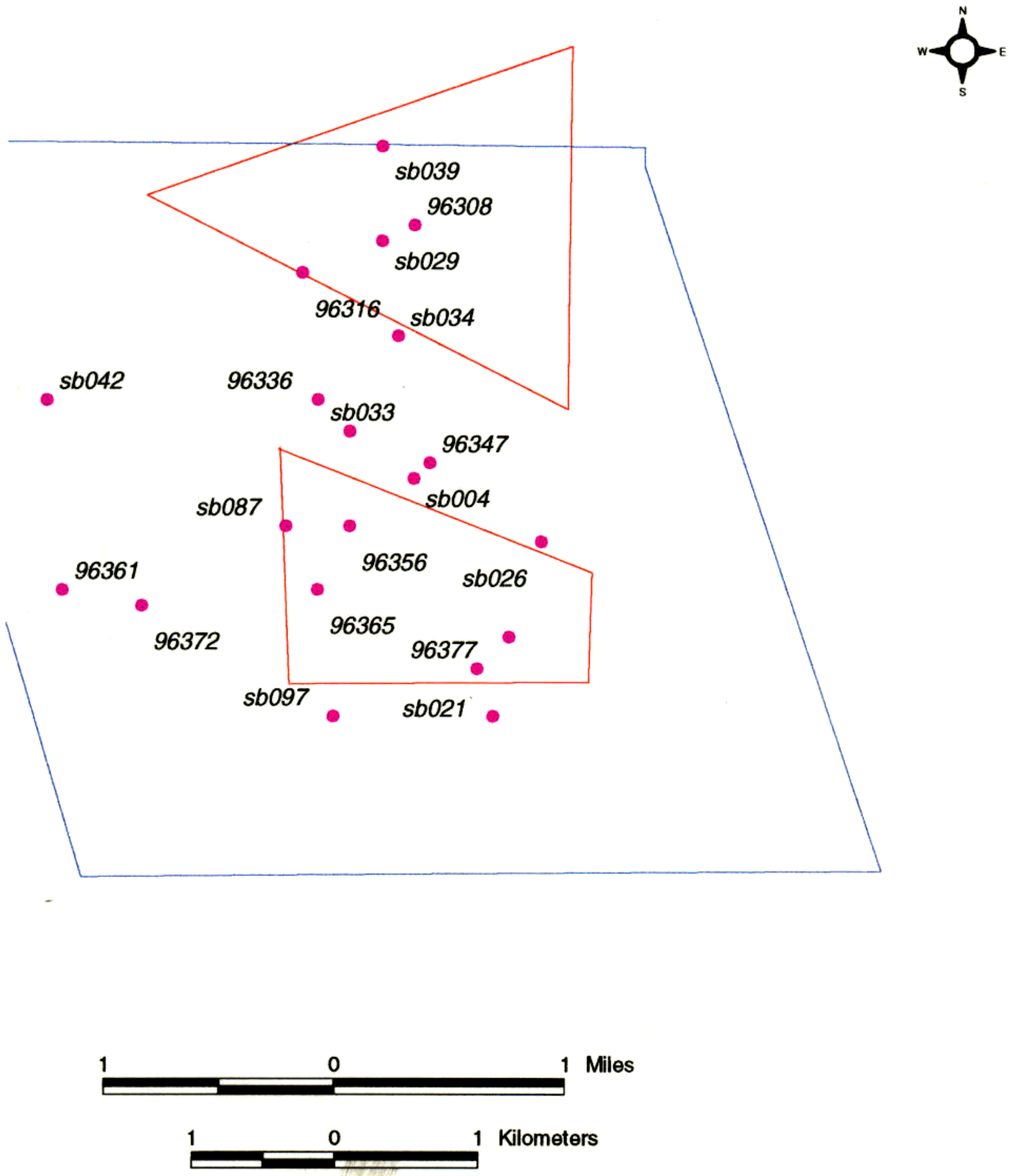


Figure 10. Smith-MacIntyre grab sample site locations, fall 1997.

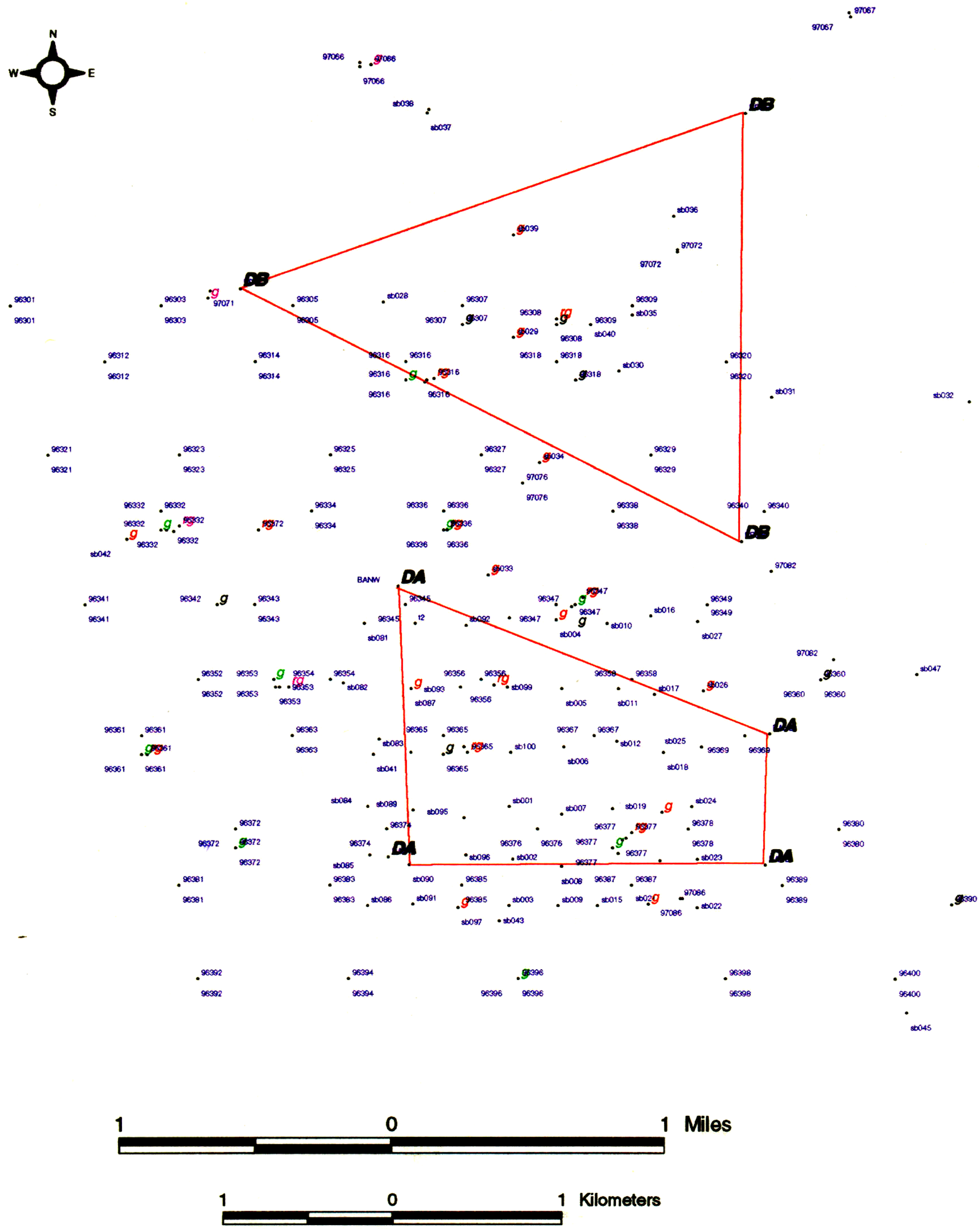


Figure 11. Sandbridge shoal region sample sites and Dredge Areas A and B (with corners marked).

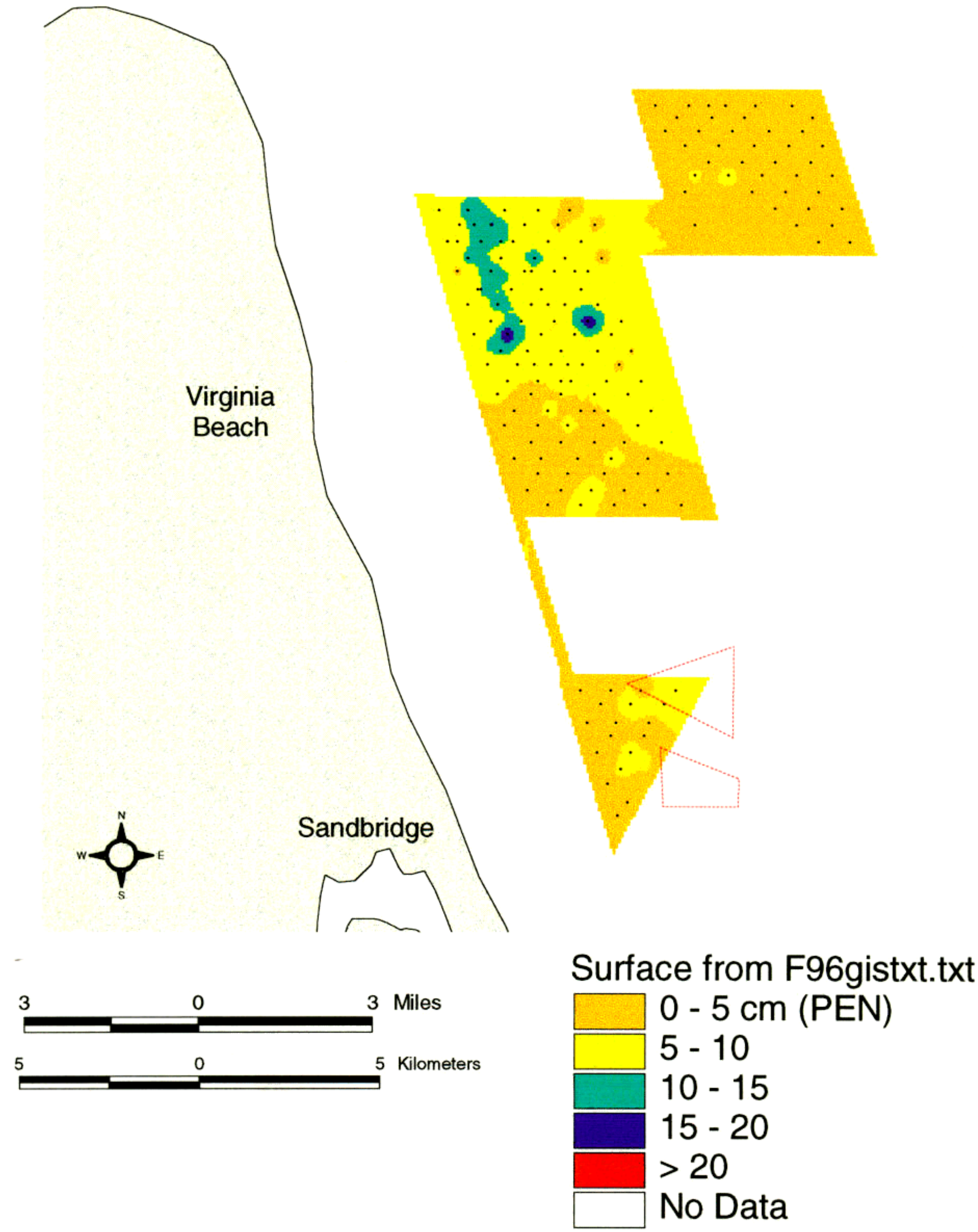


Figure 12. Spring 1996 SPI prism penetrationdepth (cm). Potential borrow areas A (southern) and B (northern) are delineated by red lines.

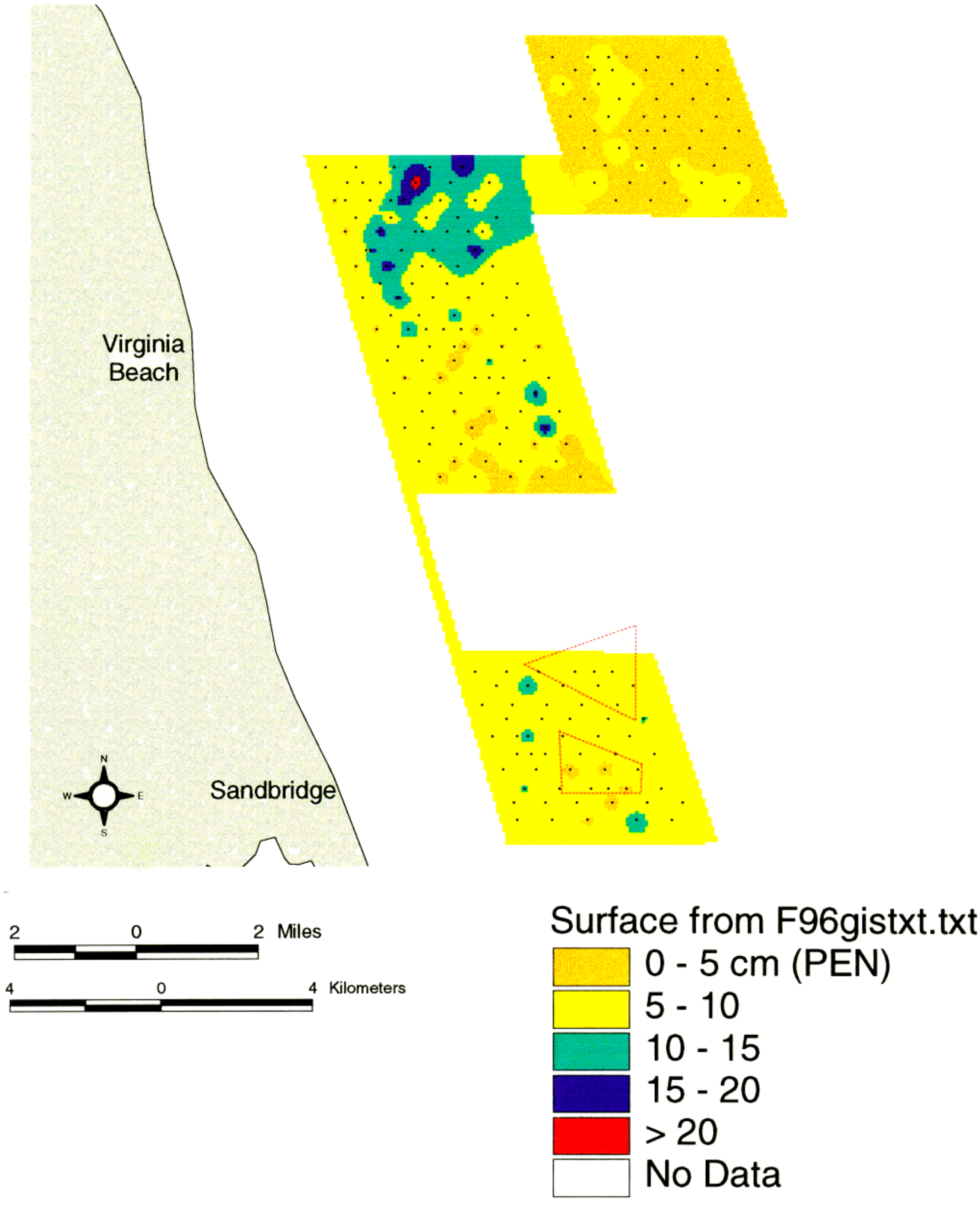


Figure 13. Fall 1996 SPI prism penetrationdepth (cm).

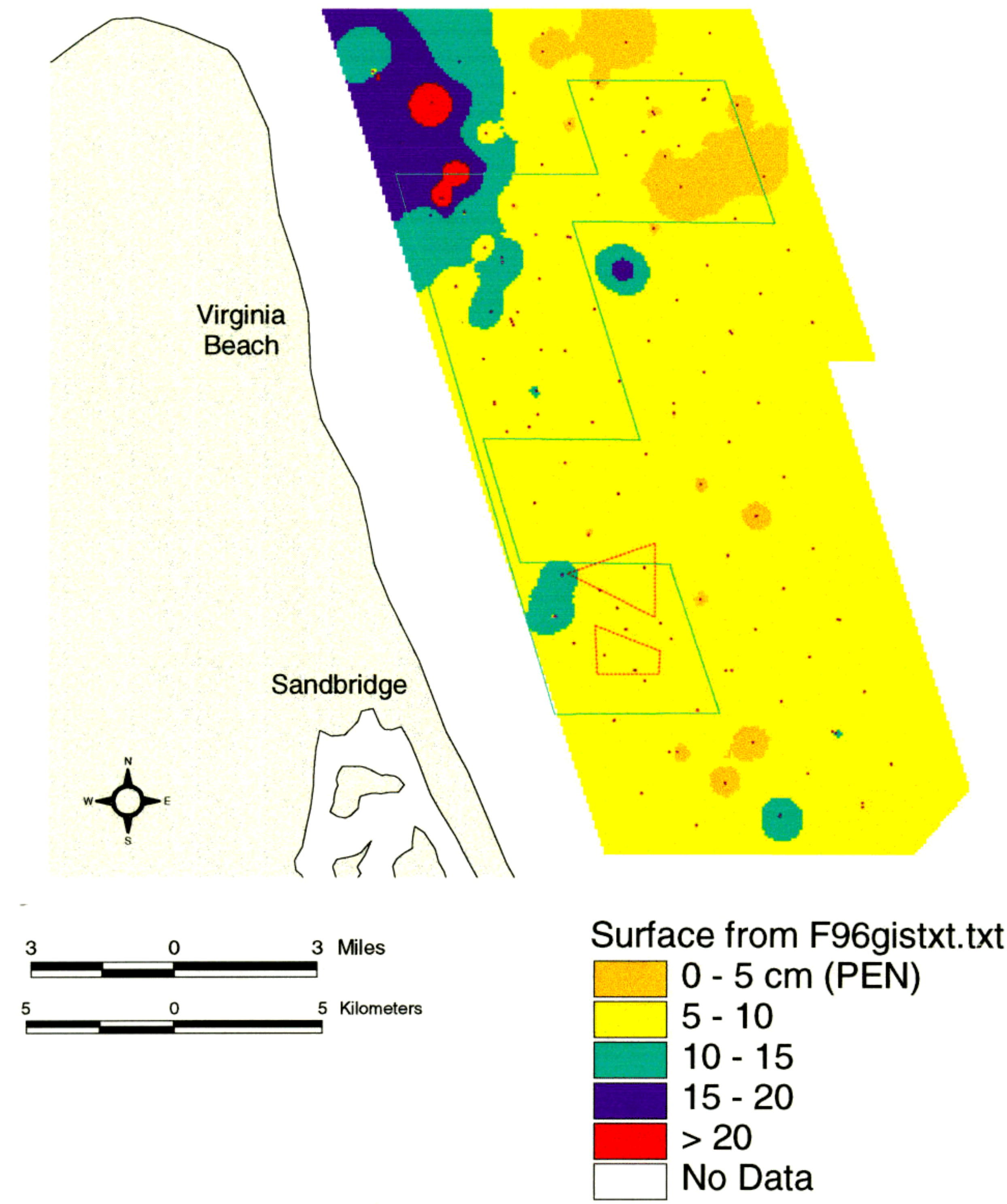


Figure 14. Spring 1997 SPI prism penetration depth (cm). 1996 study region is delineated by green line and borrow areas are delineated by red line.

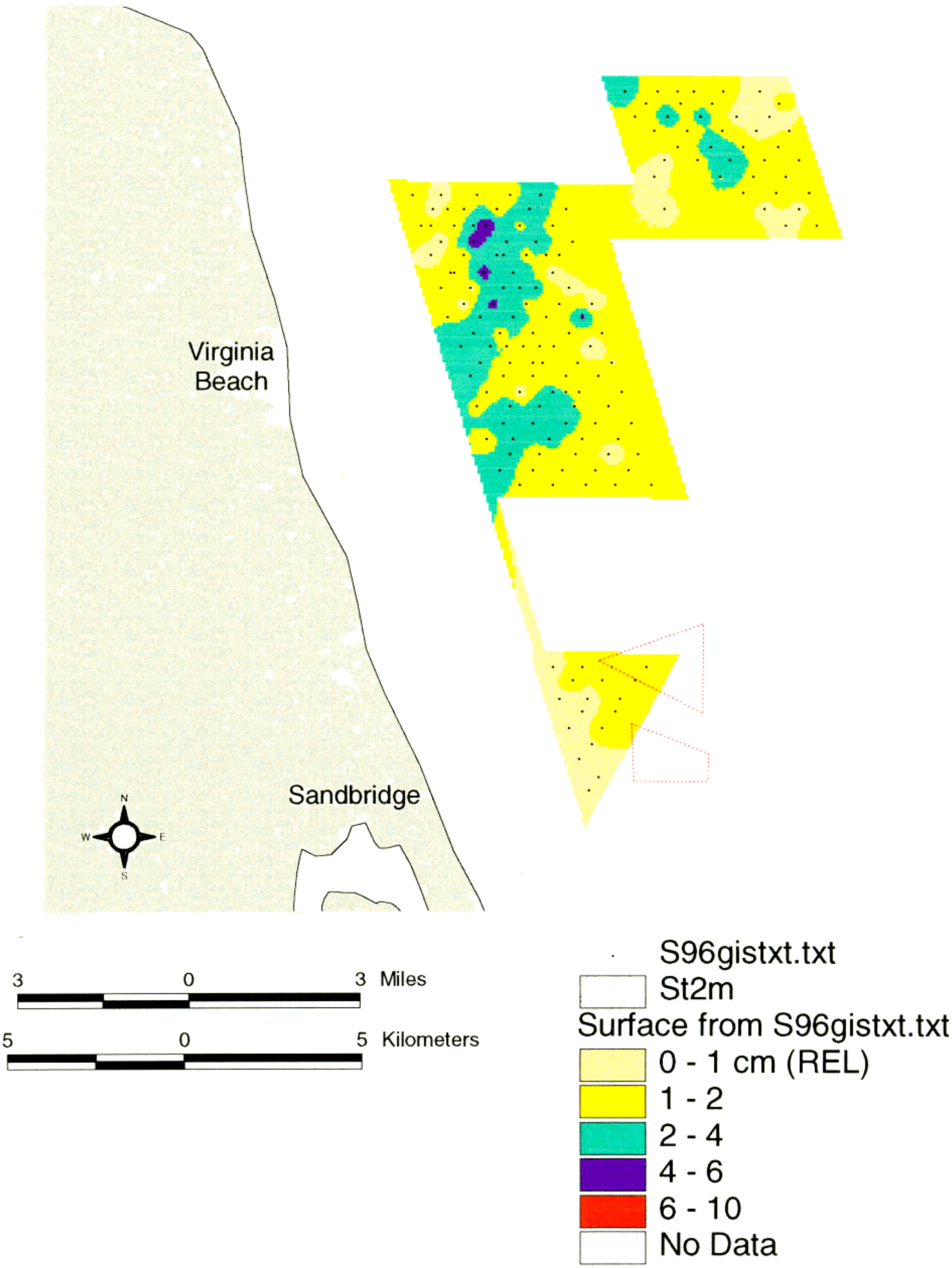


Figure 15. Spring 1996 sediment surface relief (cm) from SPI.

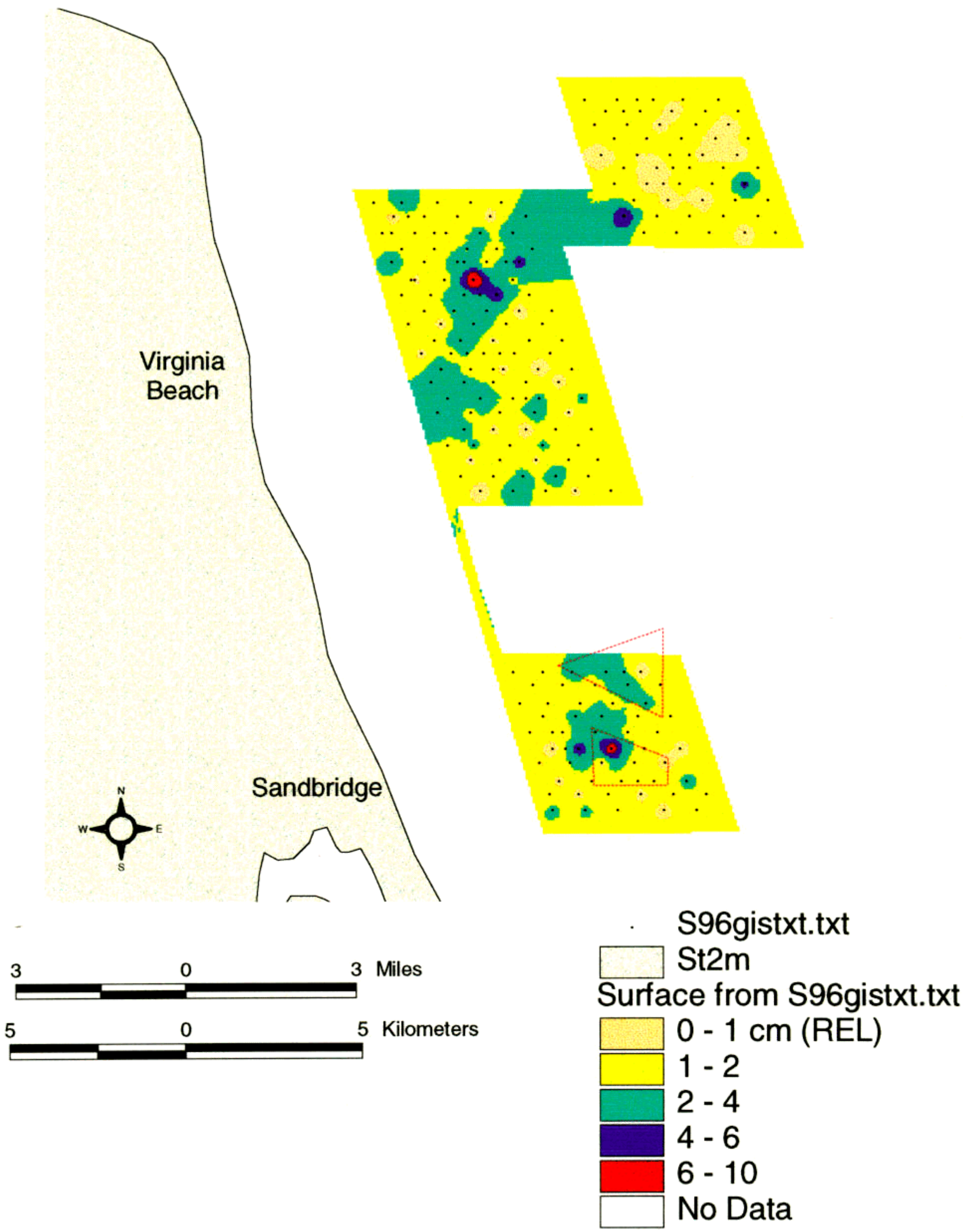


Figure 16. Fall 1996 sediment surface relief (cm) from SPI.

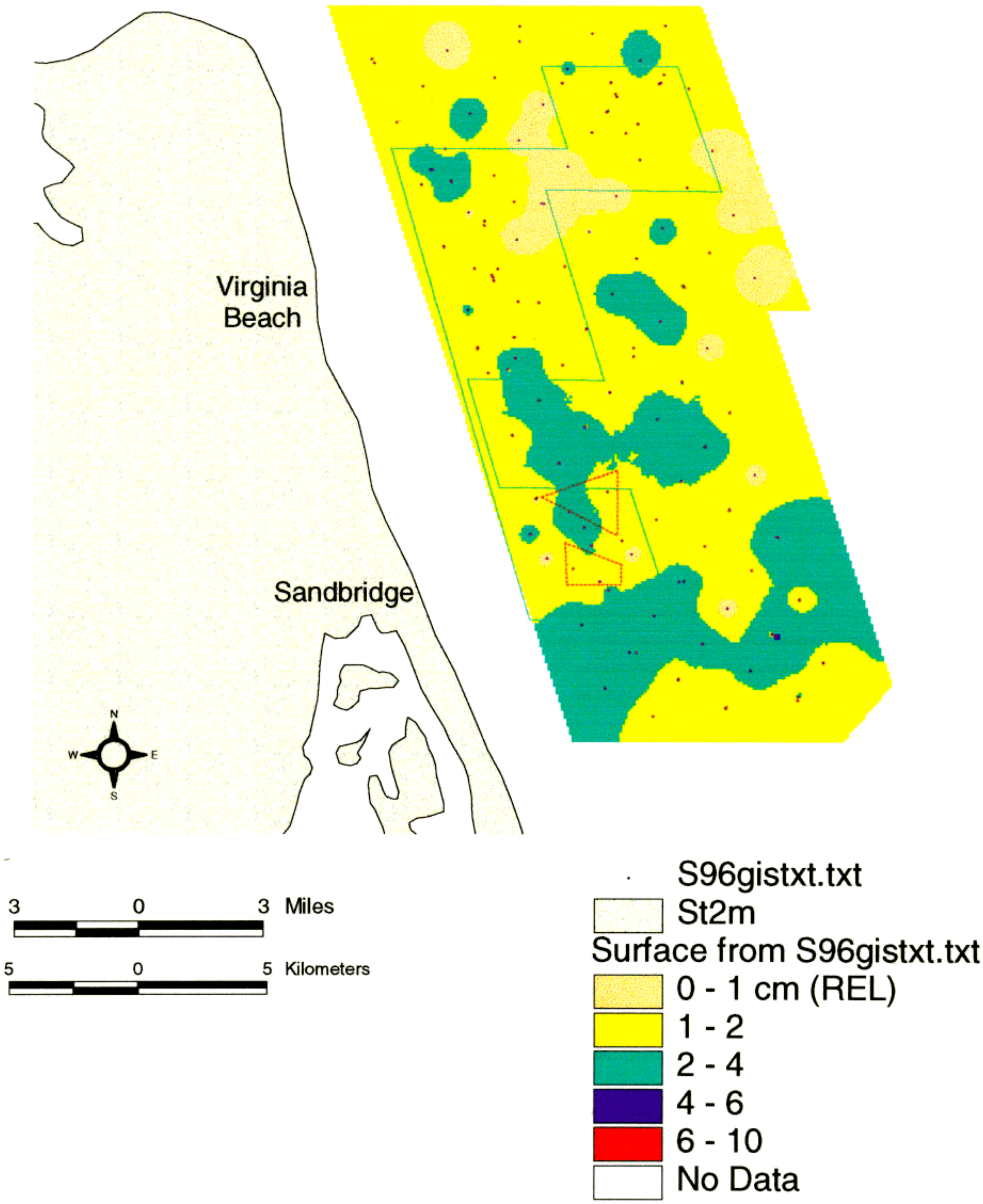


Figure 17. Spring 1997 sediment surface relief (cm) from SPI.

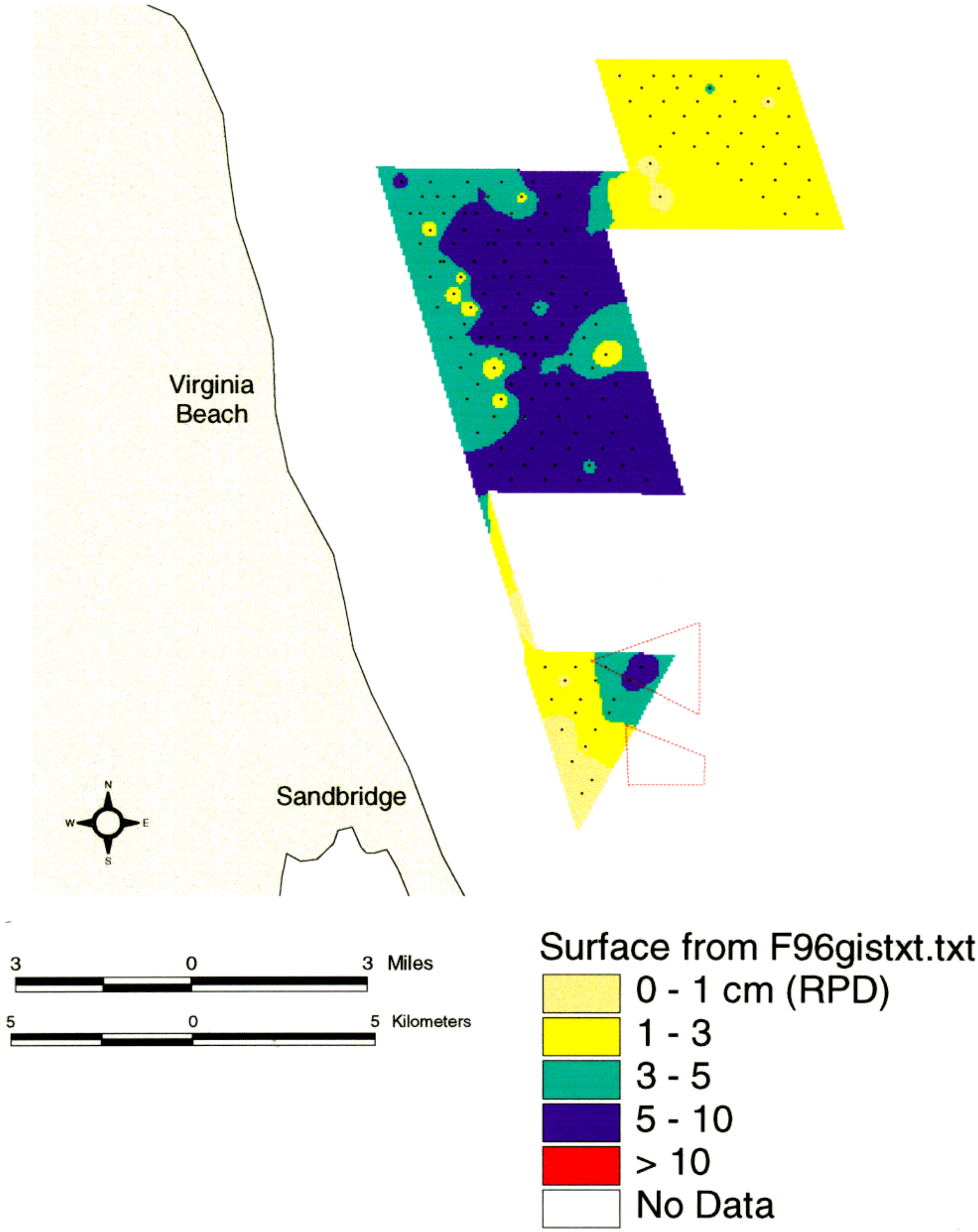


Figure 18. Spring 1996 redox potential discontinuity (RPD) layer depth (cm).

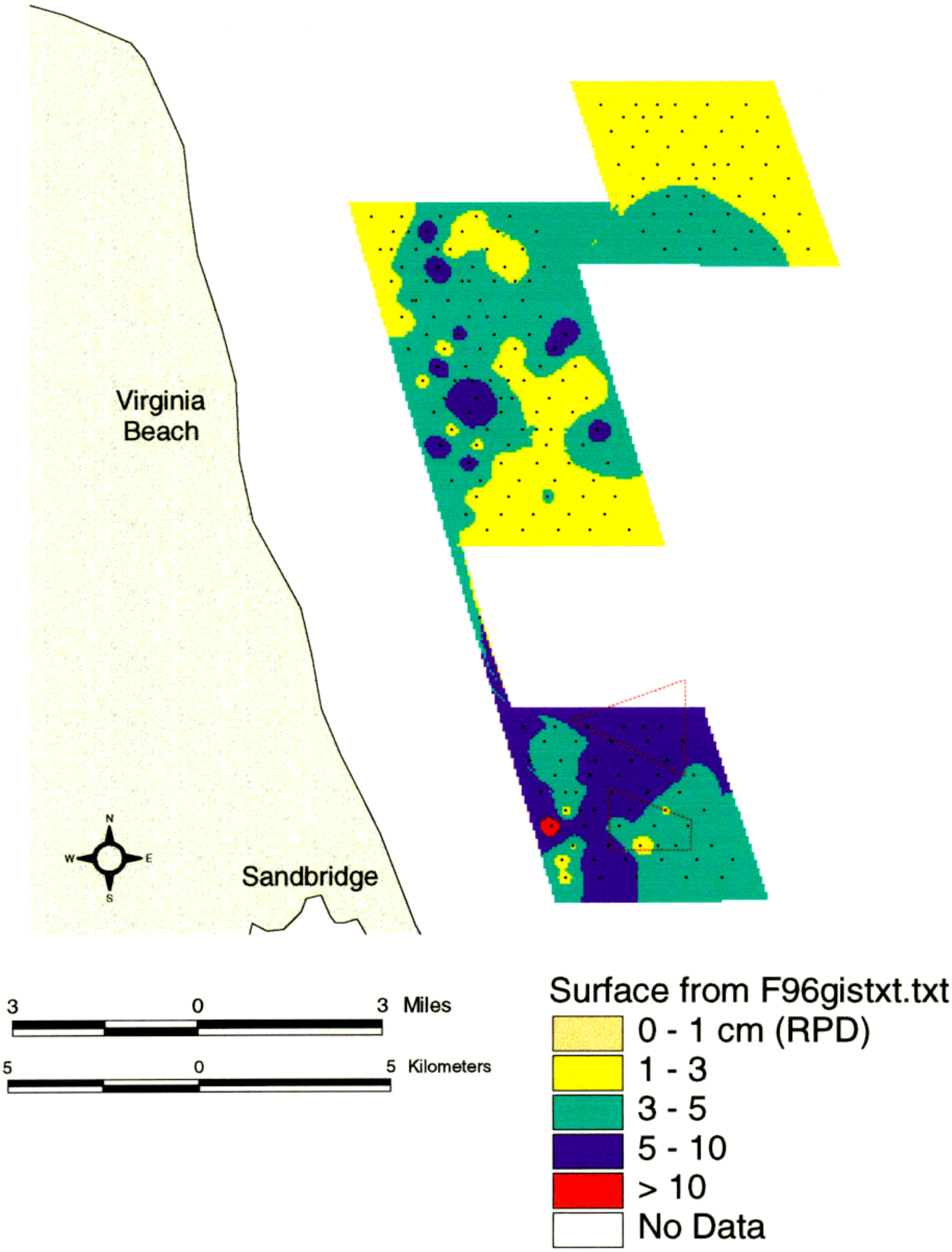


Figure 19. Fall 1996 redox potential discontinuity (RPD) layer depth (cm) from SPI.

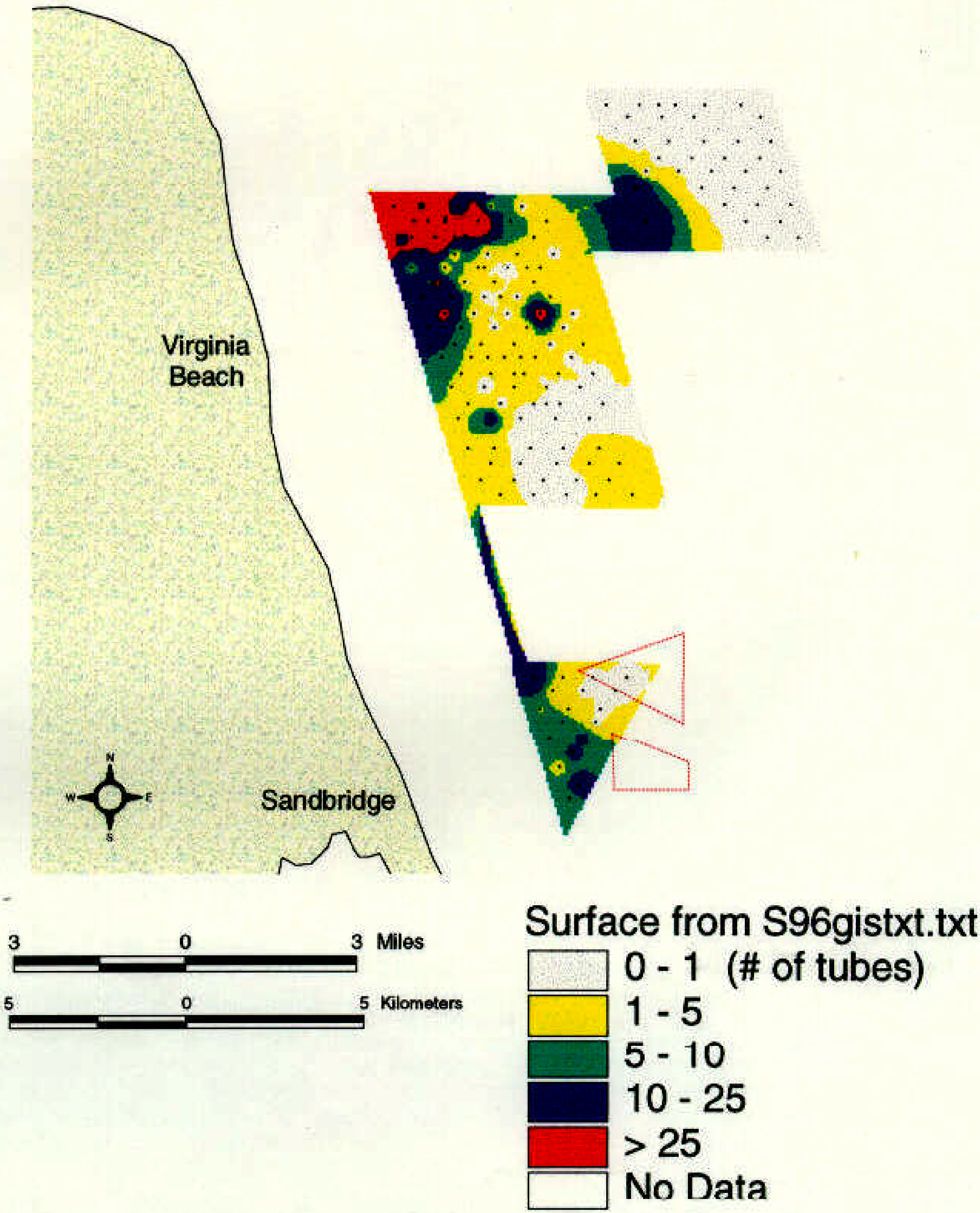


Figure 20. Spring 1996, number of infaunal tubes visible at the sediment-water interface.

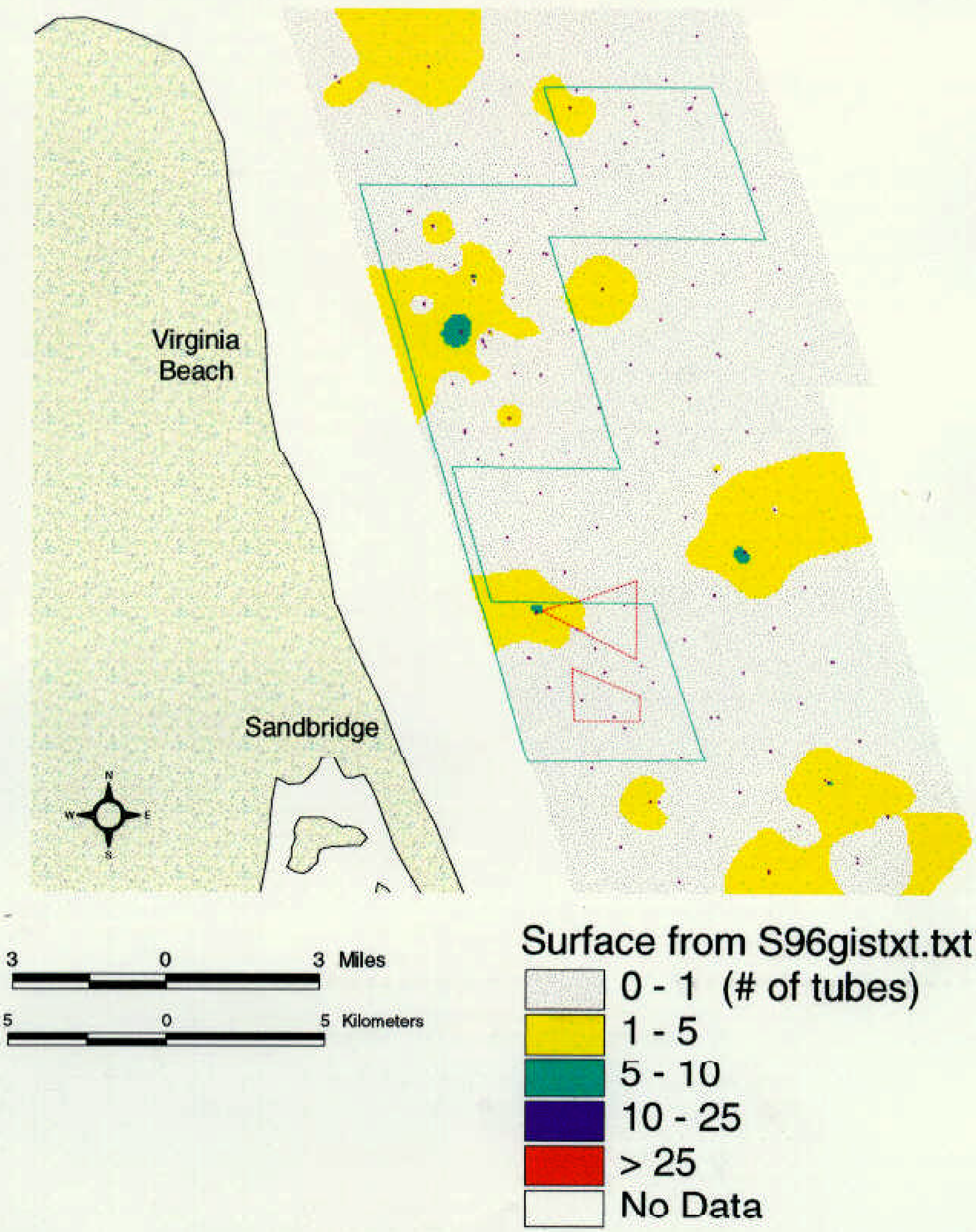


Figure 21. Spring 1997, number of infaunal tubes visible at the sediment-water interface.

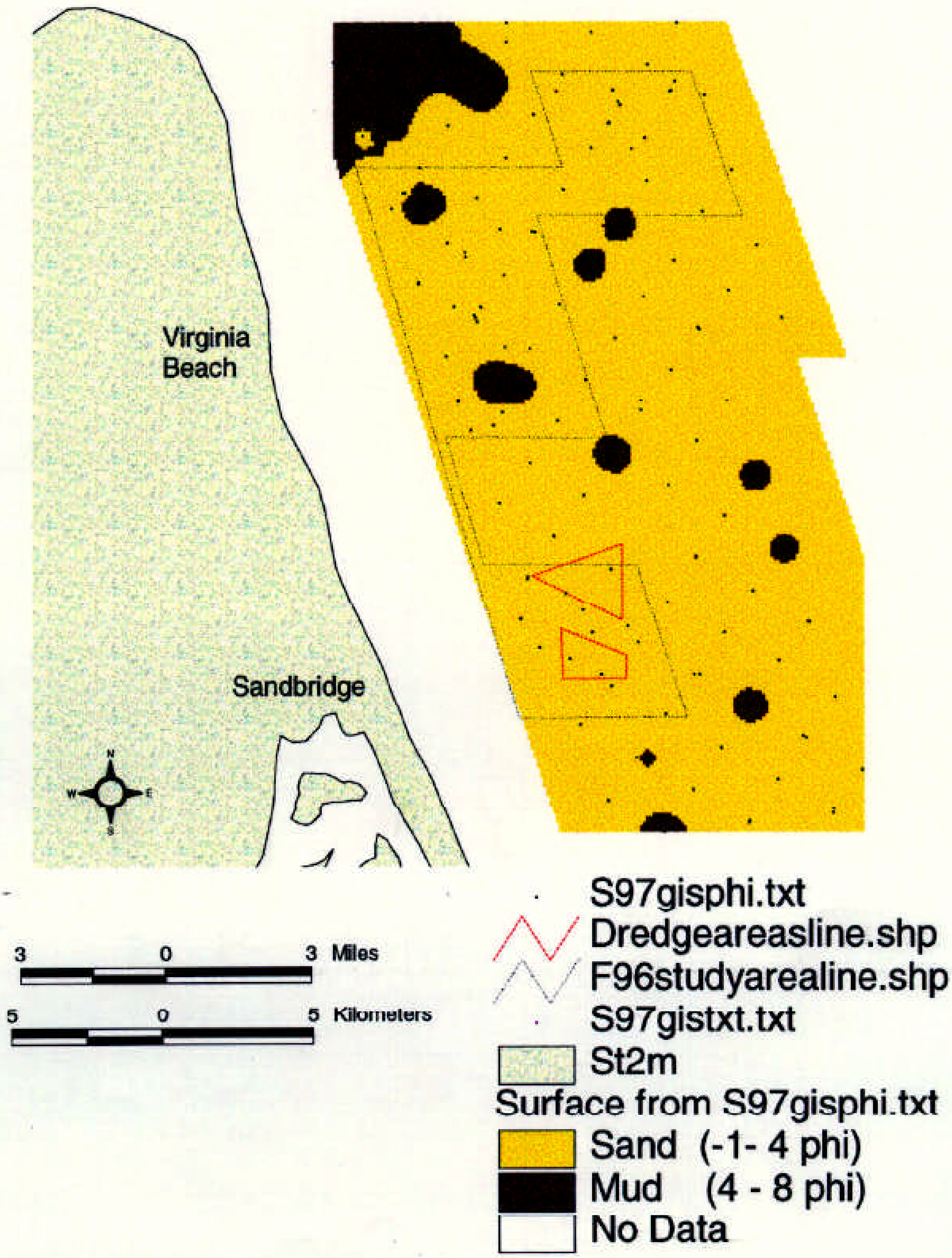


Figure 22. Spring 1997 sediment type offshore Virginia.

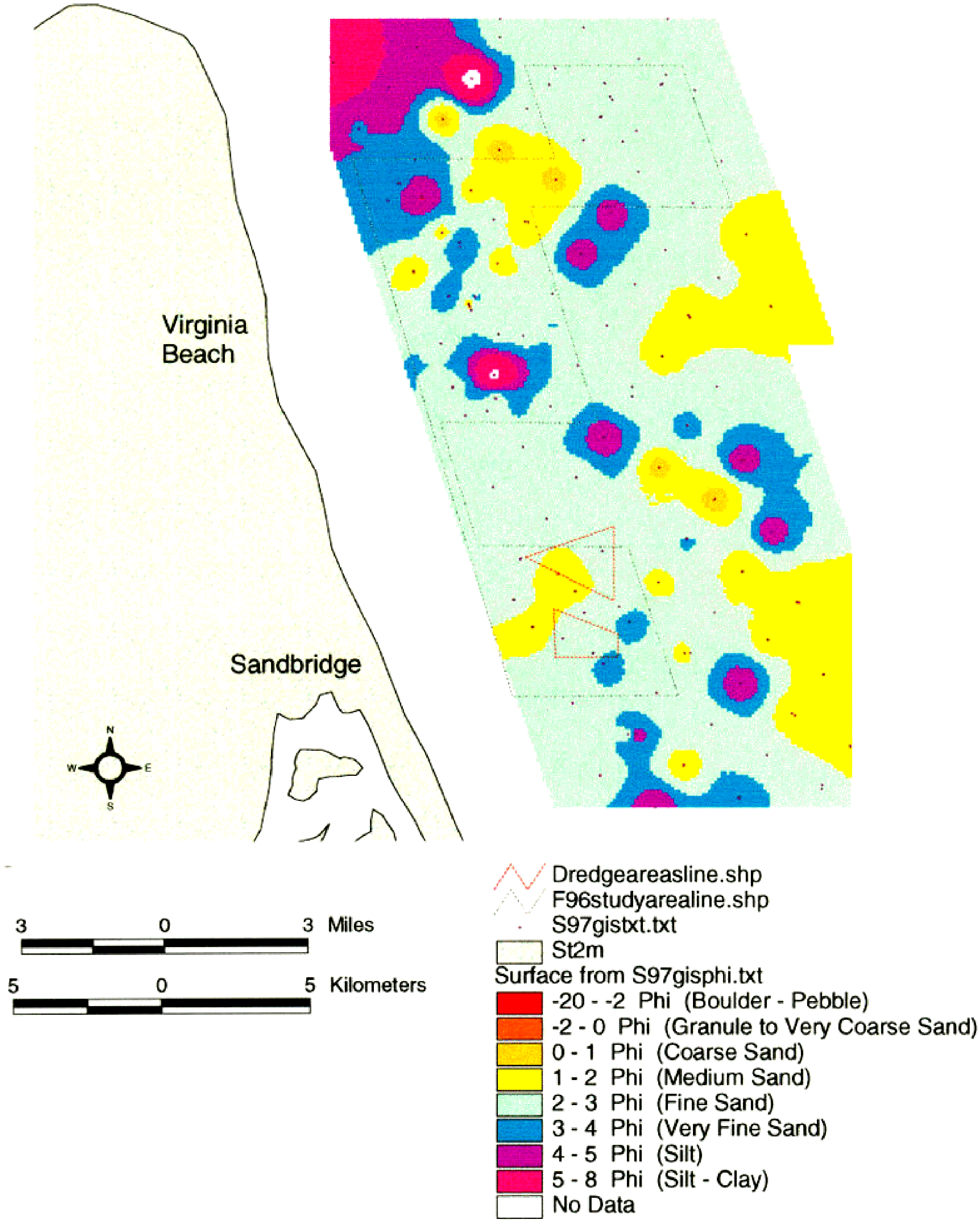


Figure 23. Spring 1997 sediment phi offshore Virginia.

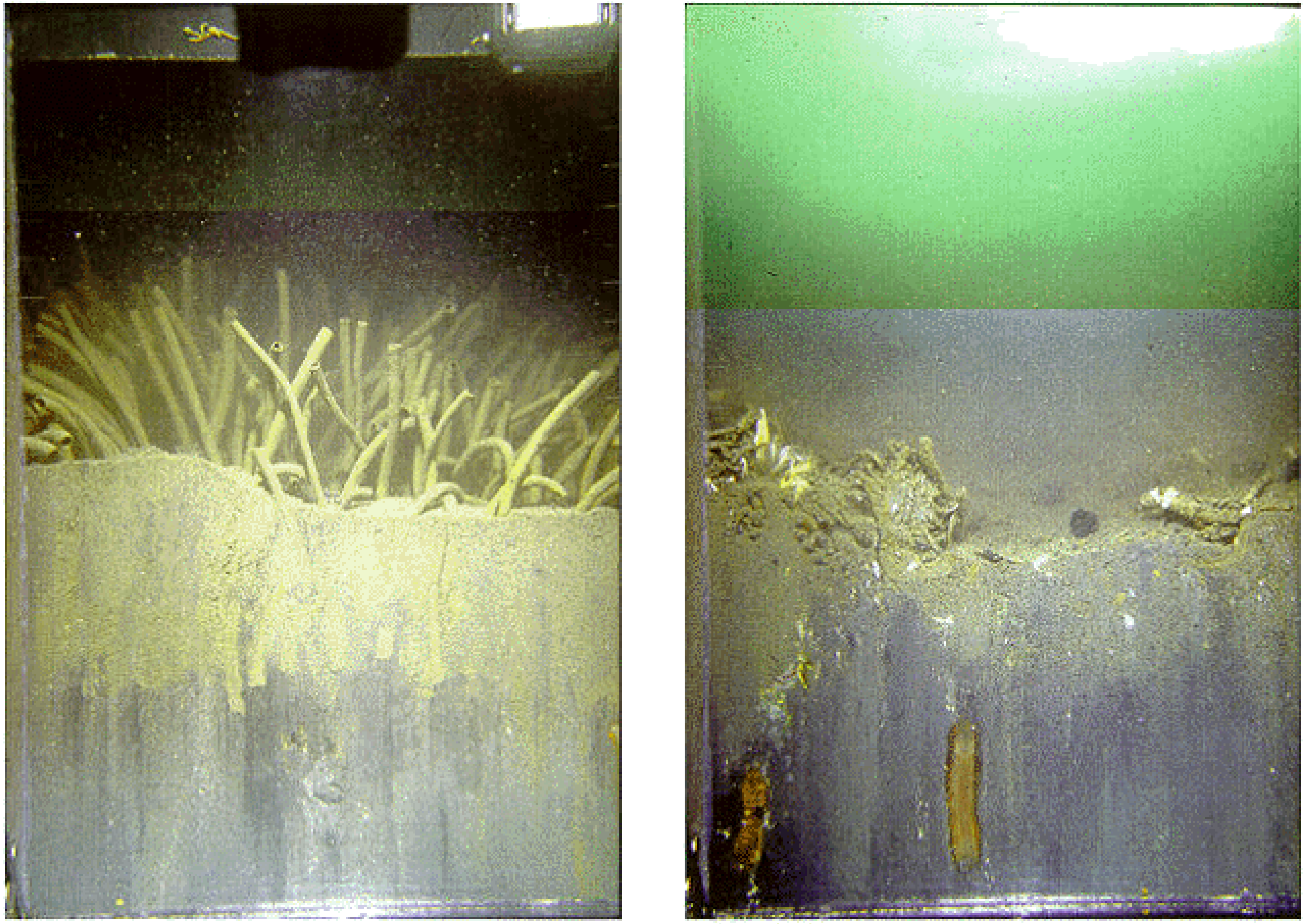


Figure 24. Habitat class A, biologically dominated silty sediments

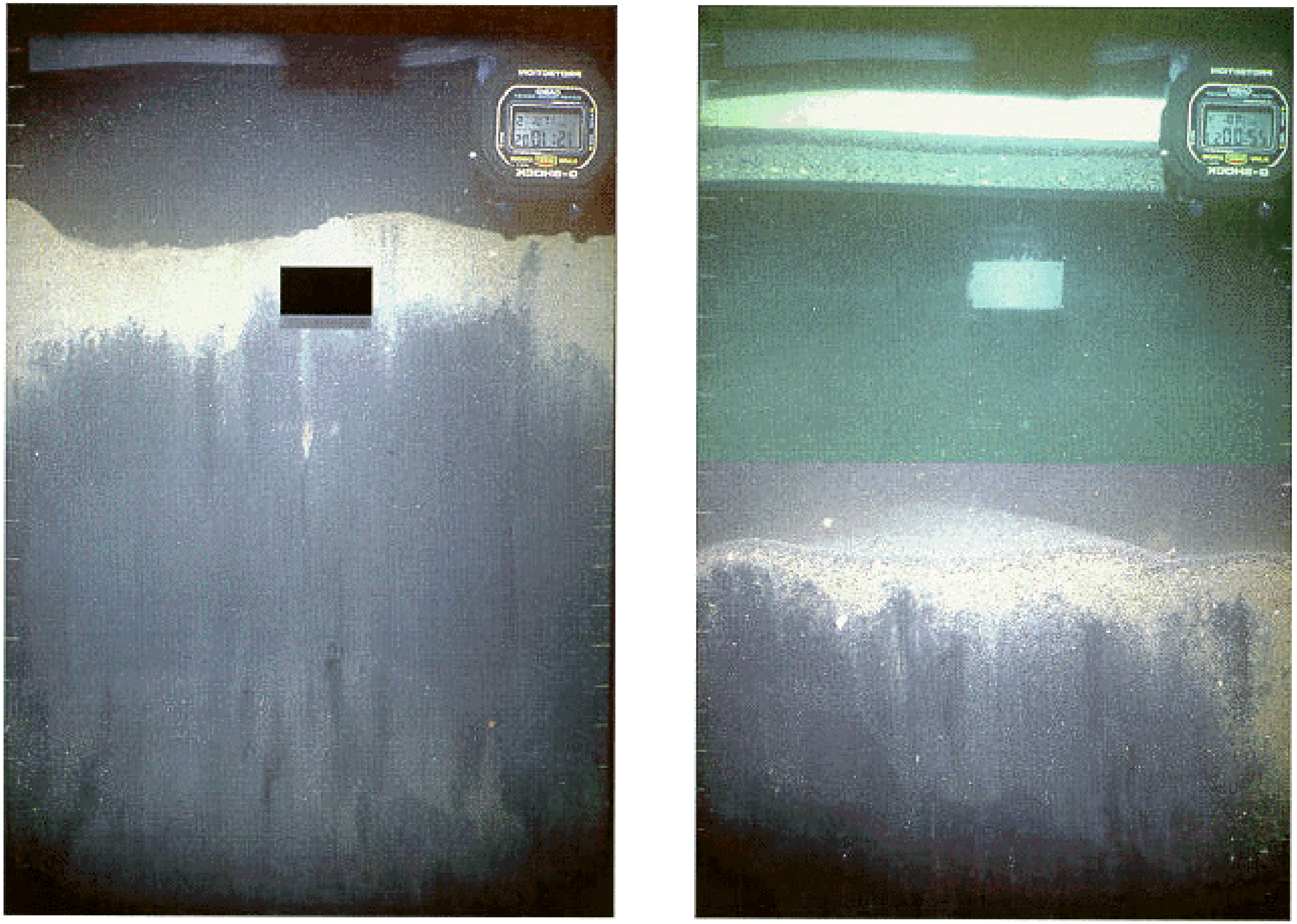


Figure 25. Habitat class B, physically dominated silty sediments.

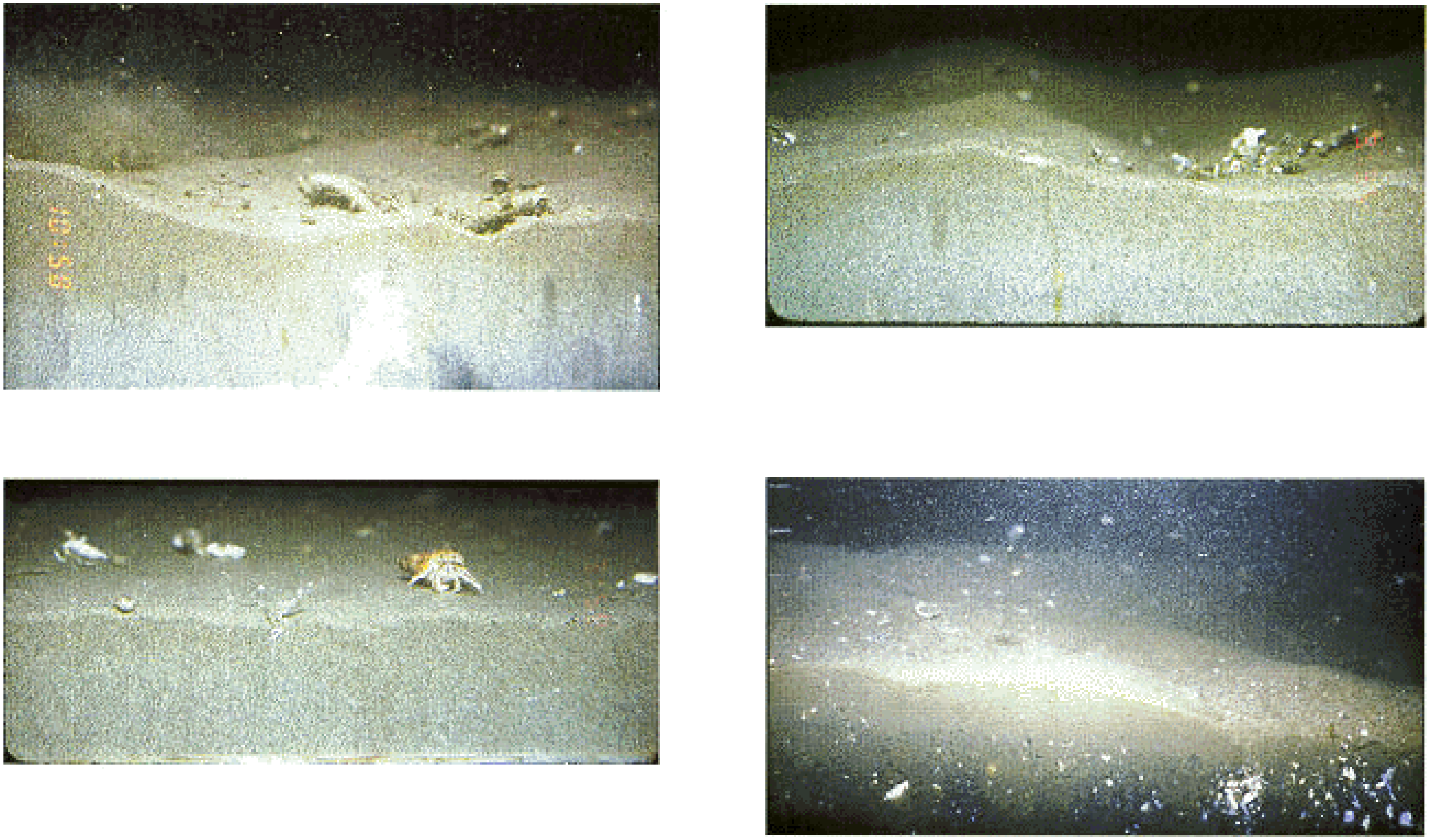


Figure 26. Habitat class C, combined biological and physical feature presence, silty fine sand to very fine sand sediments.

Figure 27. Habitat class D. physically dominated fine sand sediments.

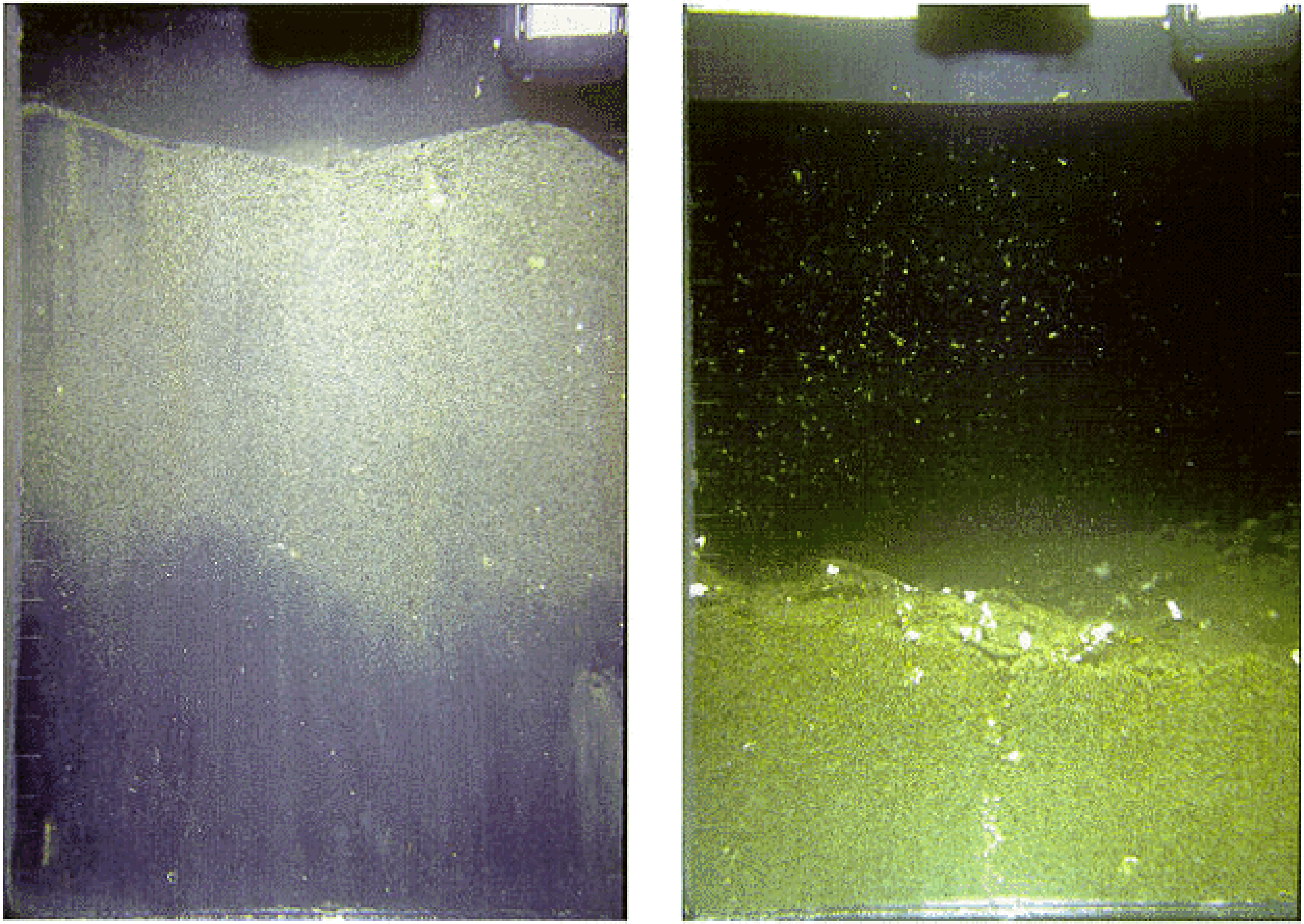


Figure 28. Habitat class E, biologically dominated fine sand sediments

Figure 29. Habitat class F, physically dominated medium sand sediments with shell fragments.

Figure 30. Habitat class G, biologically dominated medium sand sediments with shell fragments.

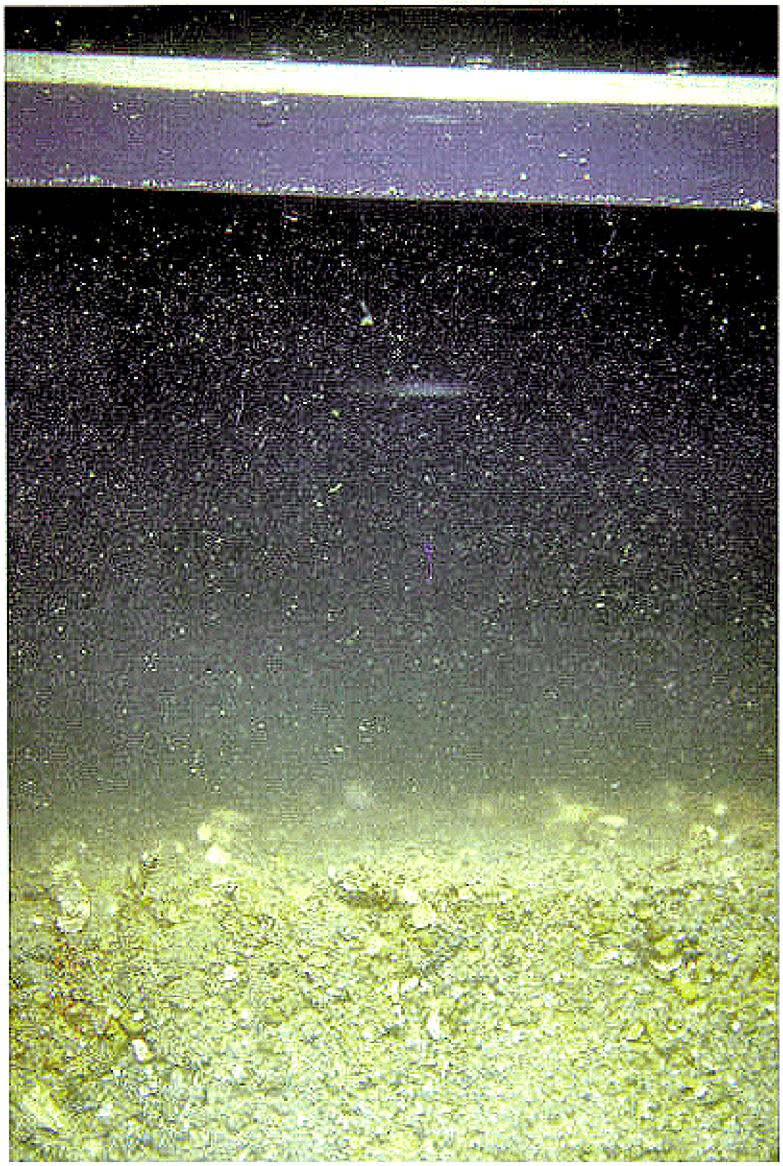


Figure 31. Habitat class H, physically dominated coarse sand to gravel sediments.

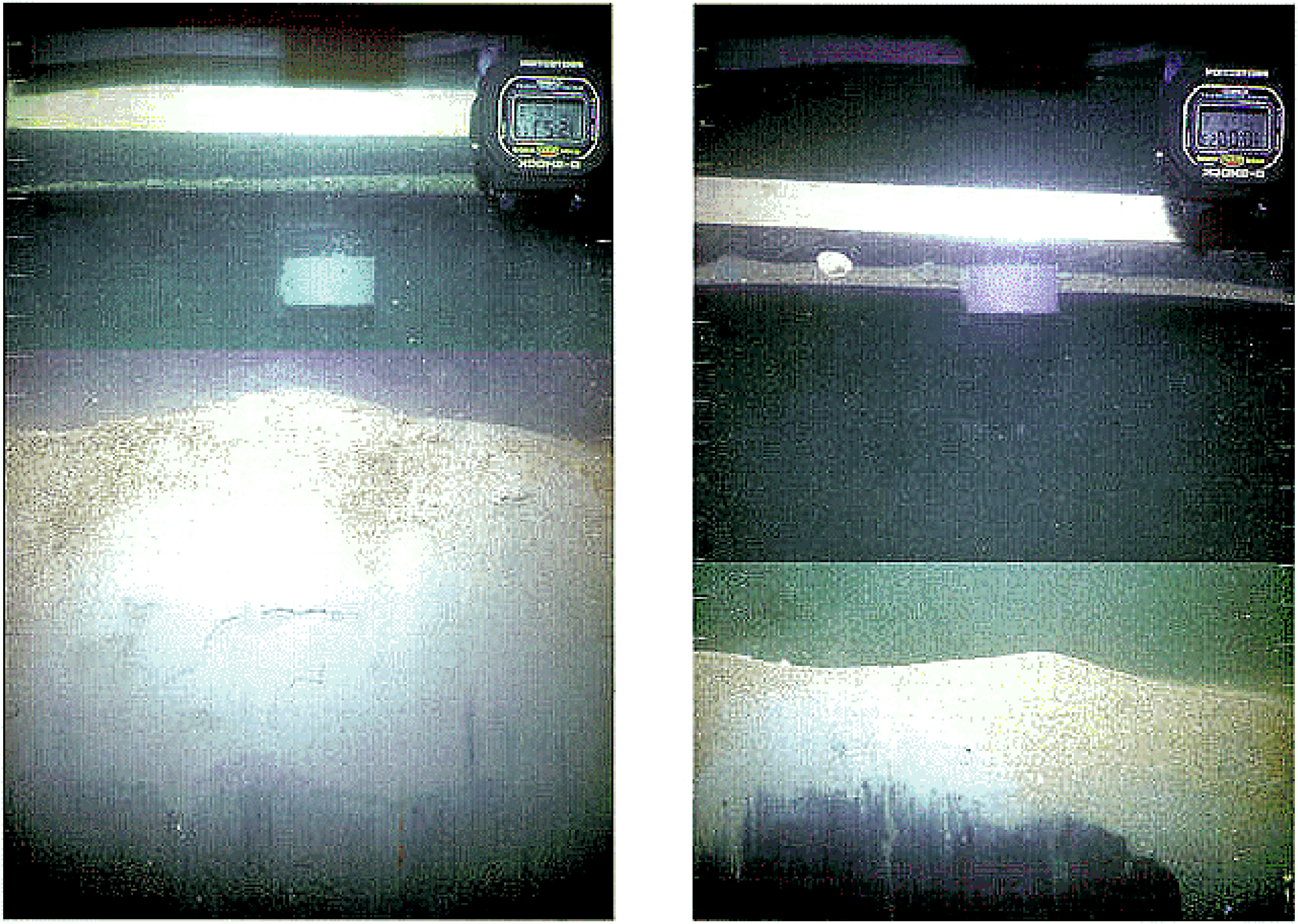


Figure32. Habitat class I. physically dominated transitional sediments: coarser grain-size material layered over finer material

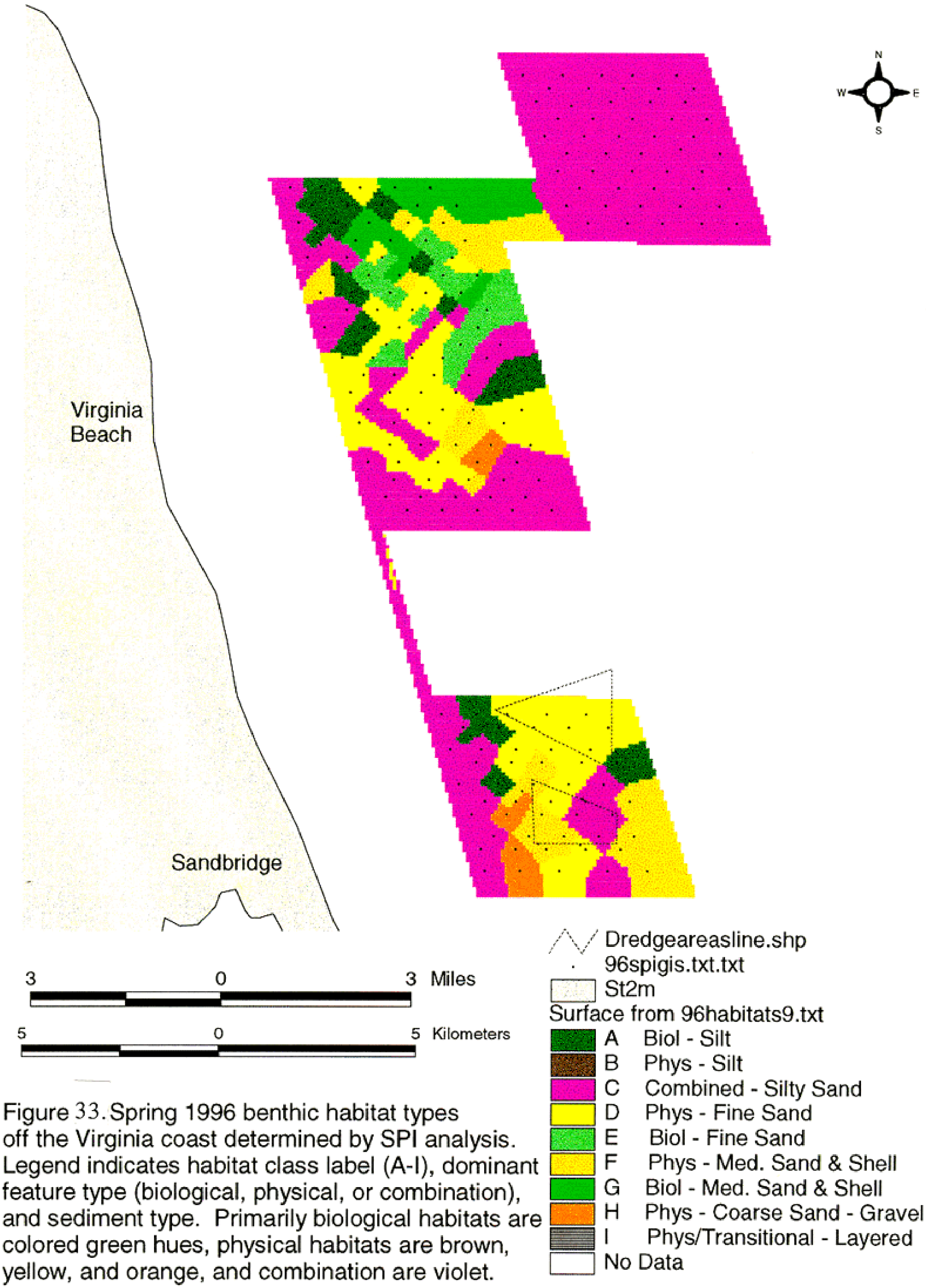


Figure 33. Spring 1996 benthic habitat types off the Virginia coast determined by SPI analysis. Legend indicates habitat class label (A-I), dominant feature type (biological, physical, or combination), and sediment type. Primarily biological habitats are colored green hues, physical habitats are brown, yellow, and orange, and combination are violet.

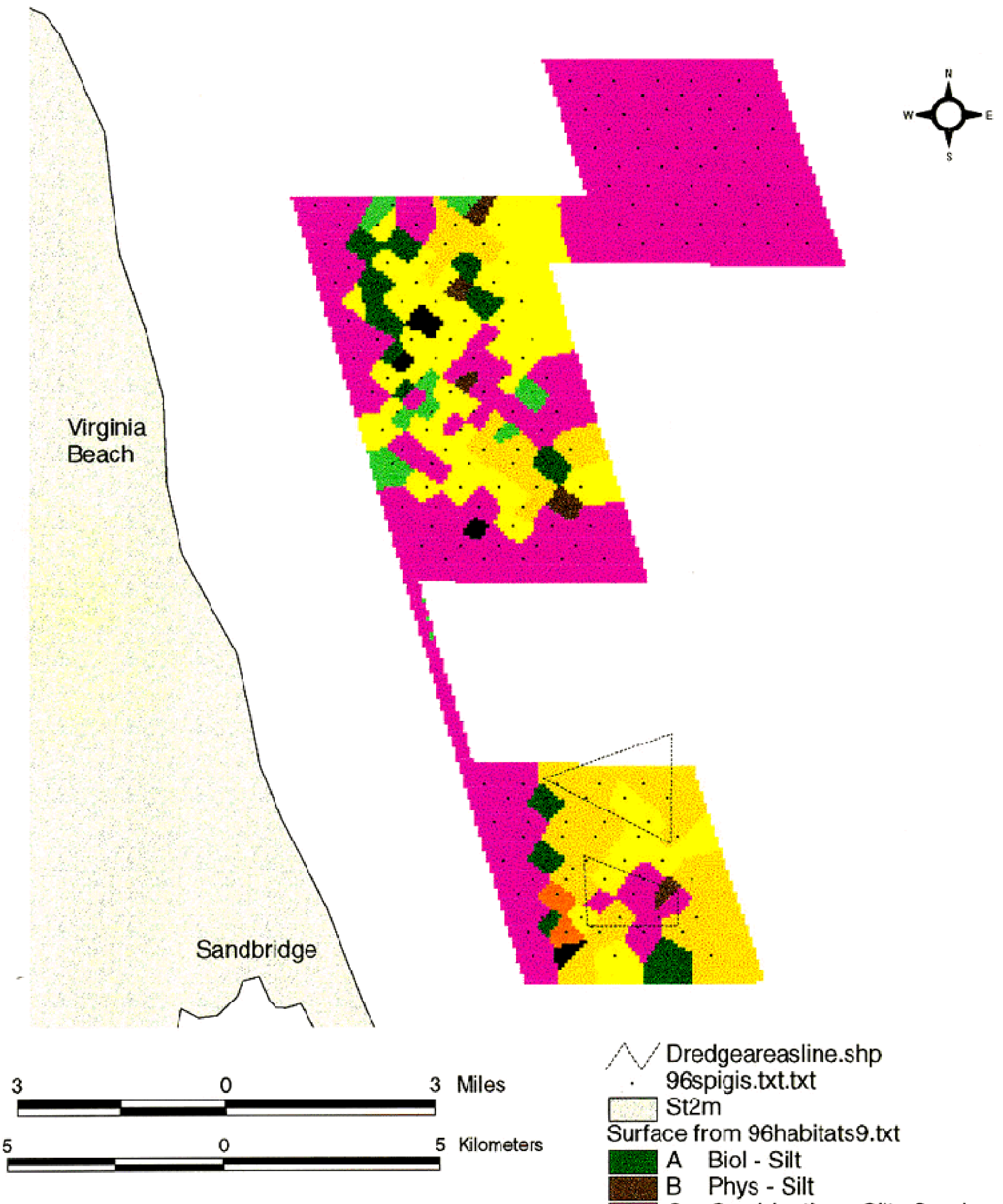


Figure 34. Fall 1996 benthic habitat types off the Virginia coast determined by SPI analysis. Legend indicates habitat class label (A-i), dominant feature type (biological, physical, or combination), and sediment type. Primarily biological habitats are colored green hues, physical habitats are brown, yellow, and orange, and comination are violet.

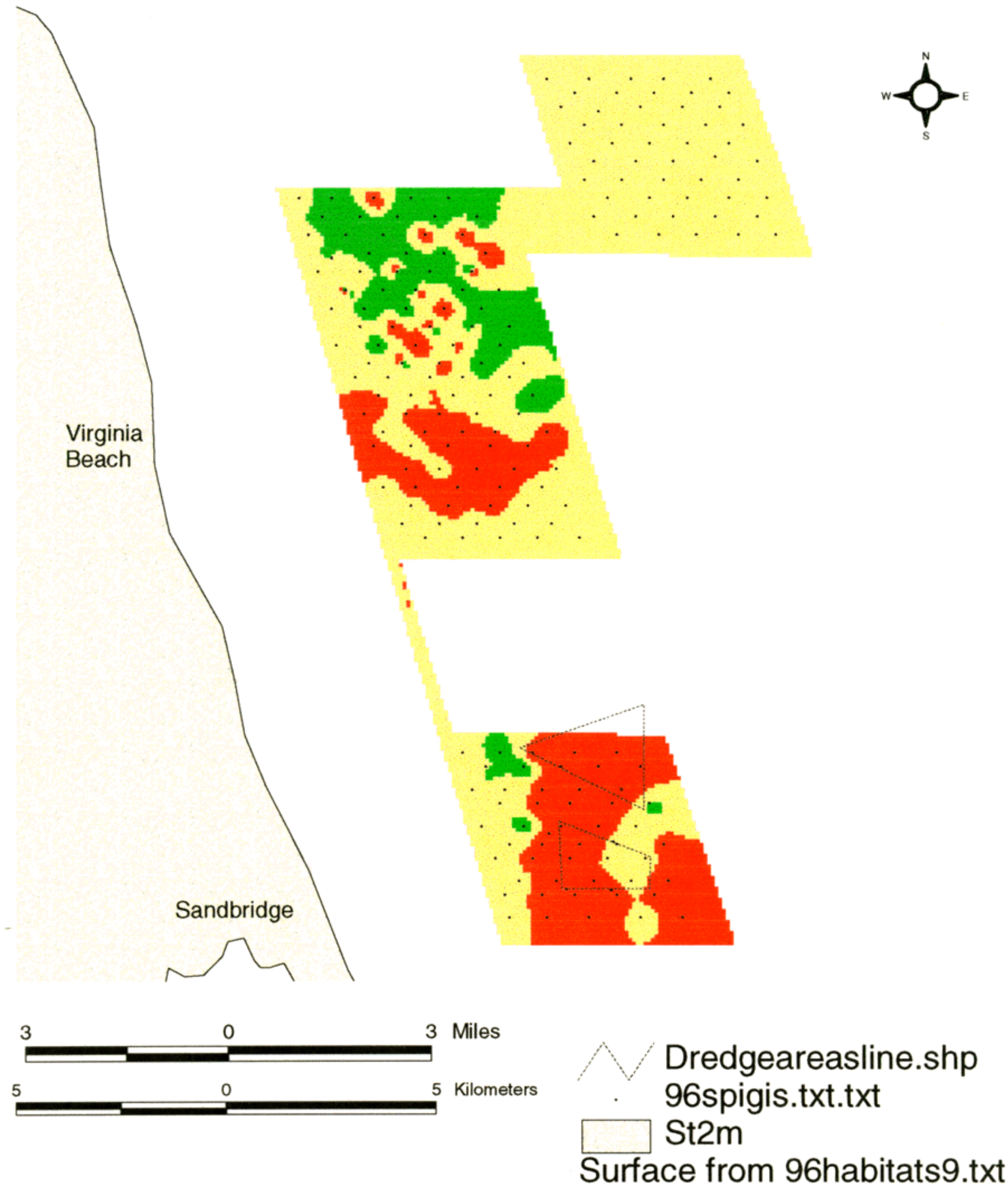
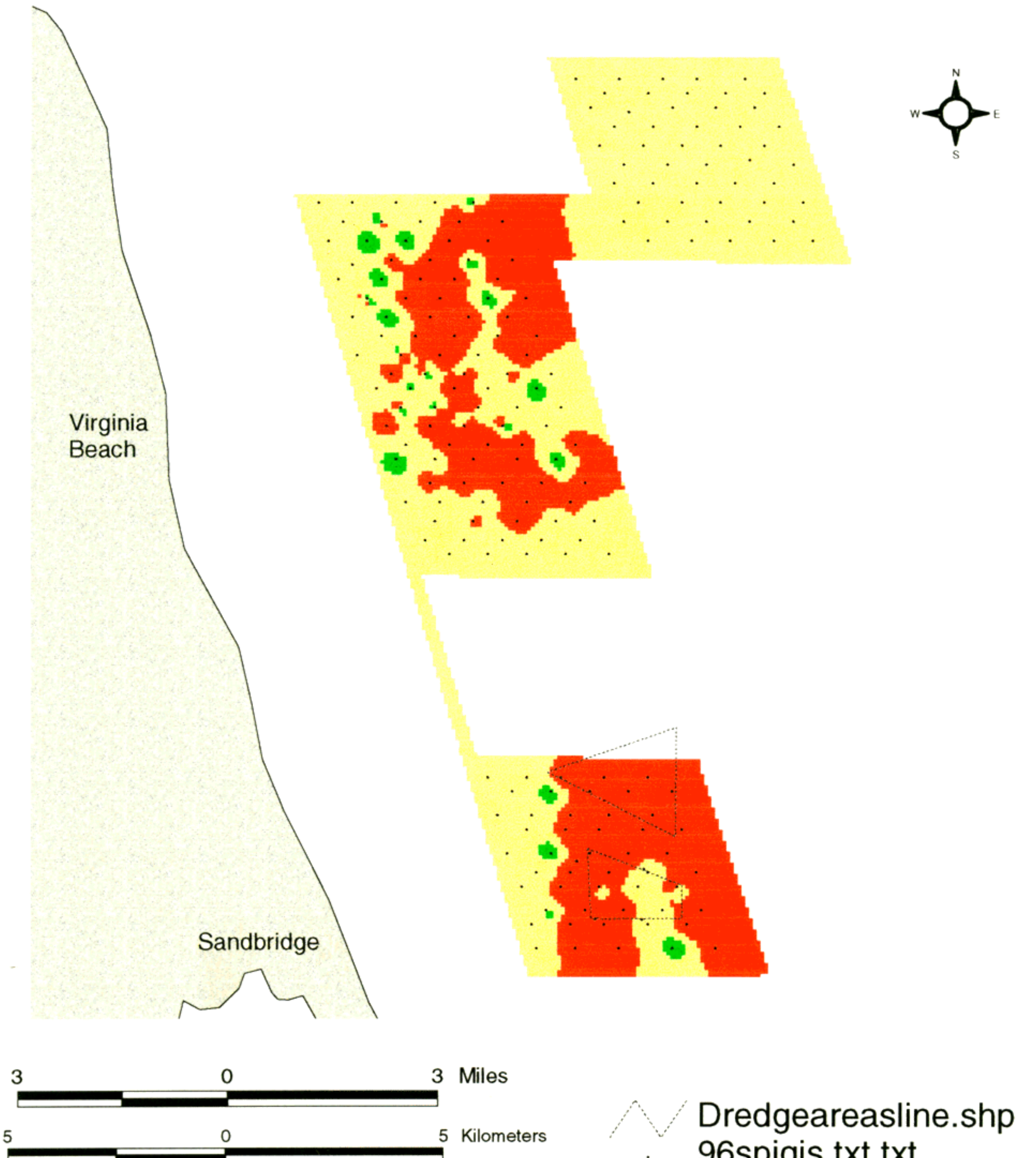


Figure 35.Spring 1996 benthic habitat types off the Virginia coast determined by SPI analysis. Habitats are grouped in terms of physical or biological dominance of substrate characteristics, or a combination of both.



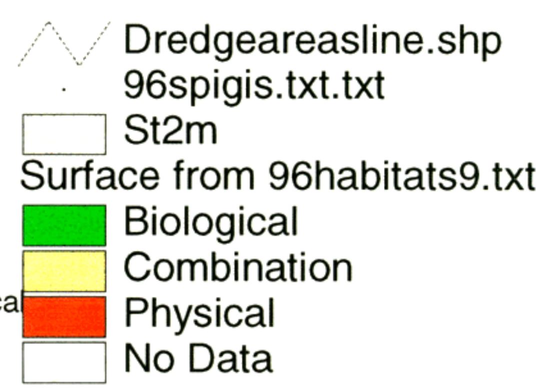


Figure 36. Fall 1996 benthic habitat types off the Virginia coast determined by SPI analysis. Habitats are grouped in terms of physical or biological dominance of substrate characteristics, or a combination of both

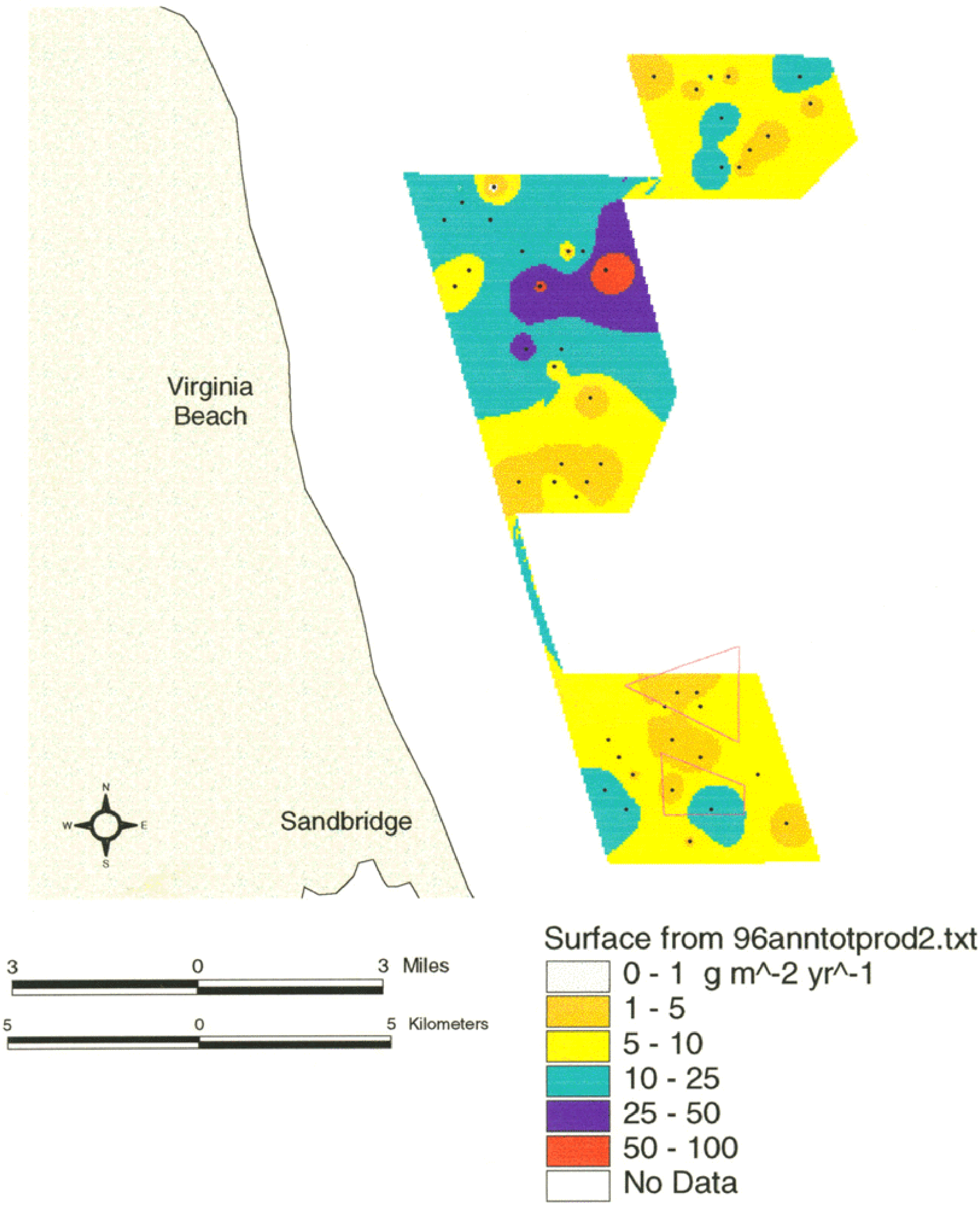


Figure 37. 1996 total annual community secondary production (g m^-2 yr^-1).

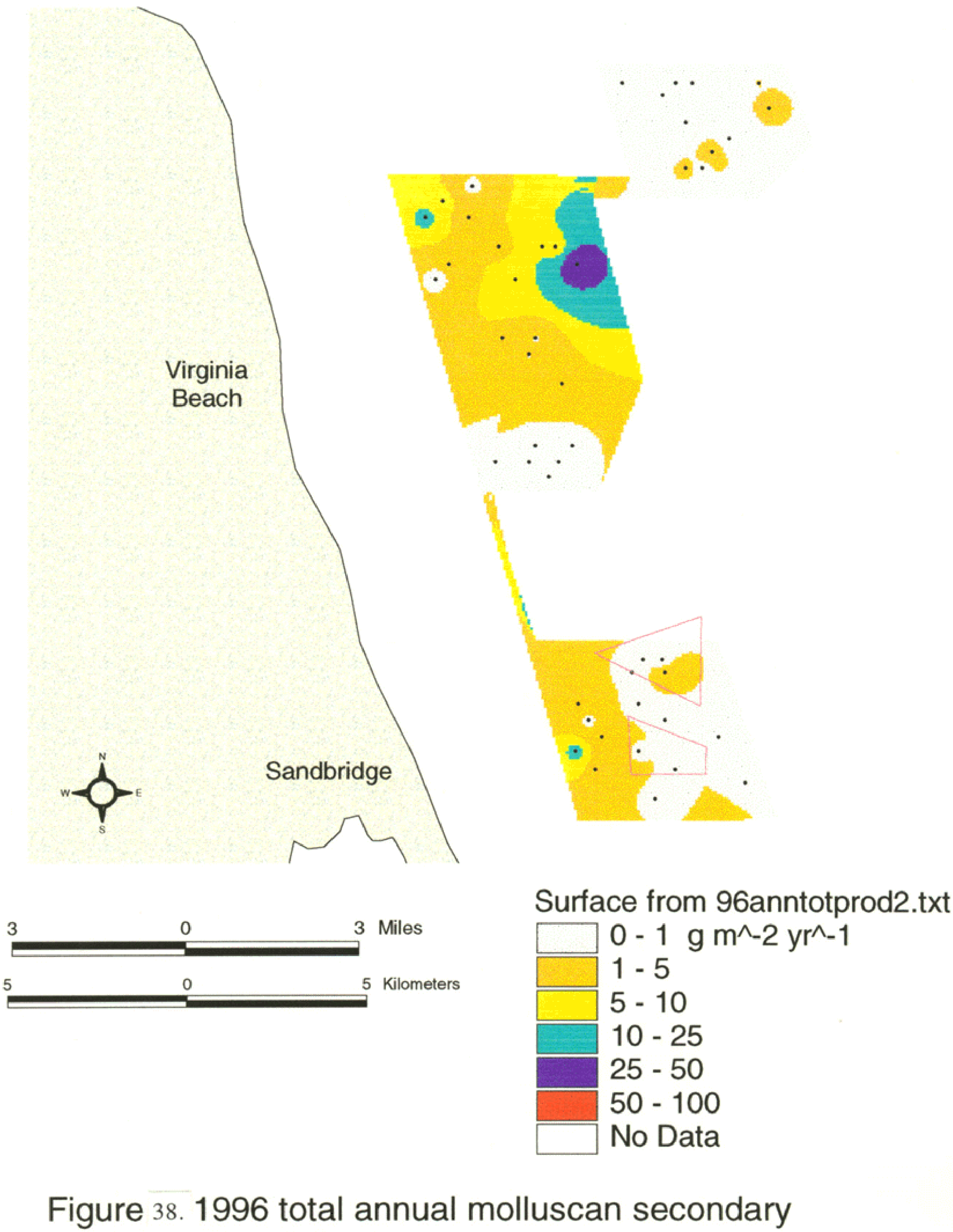


Figure 38. 1996 total annual molluscan secondary production (g m^-2 yr^-1).

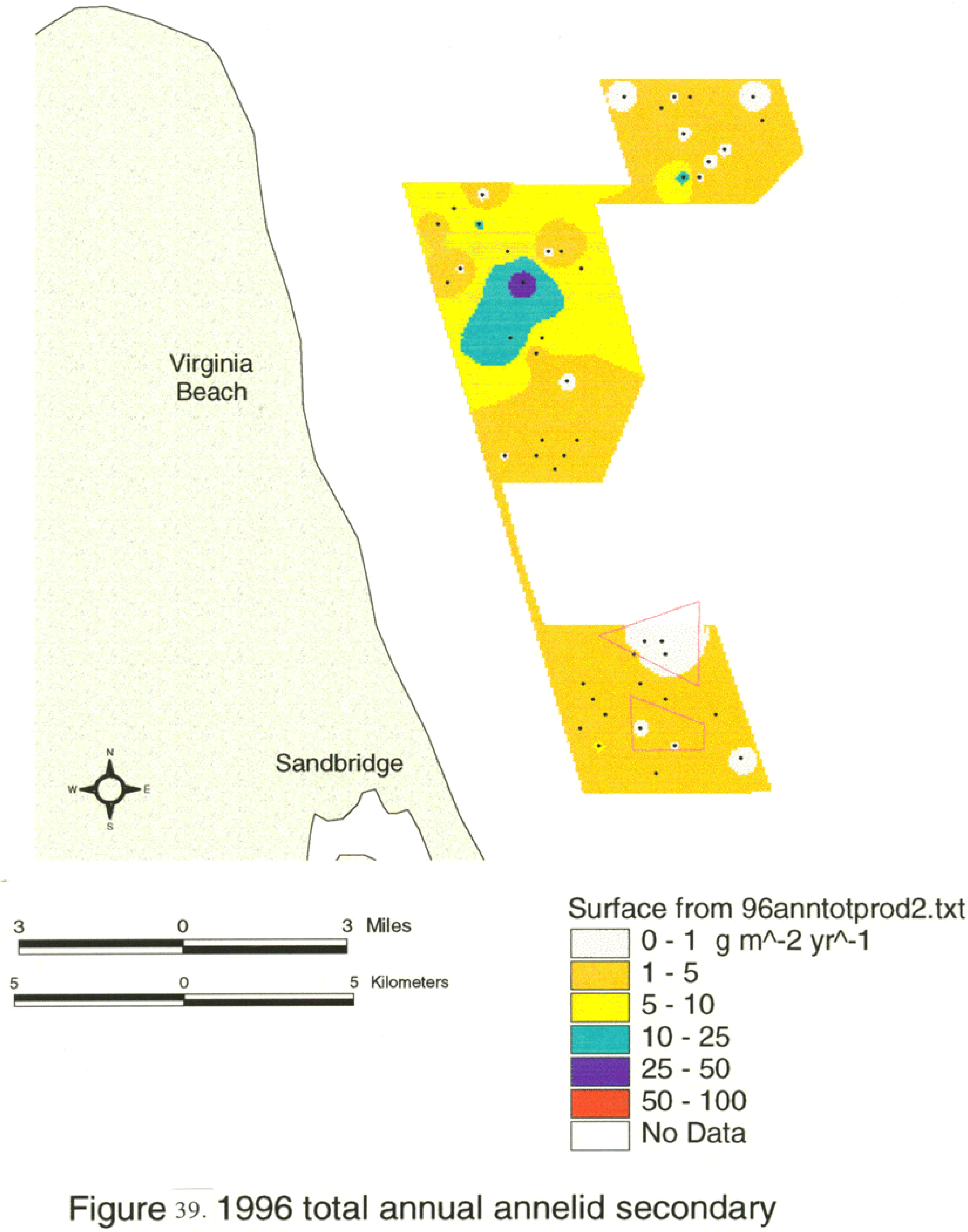


Figure 39. 1996 total annual annelid secondary production (g m^-2 yr^-1).

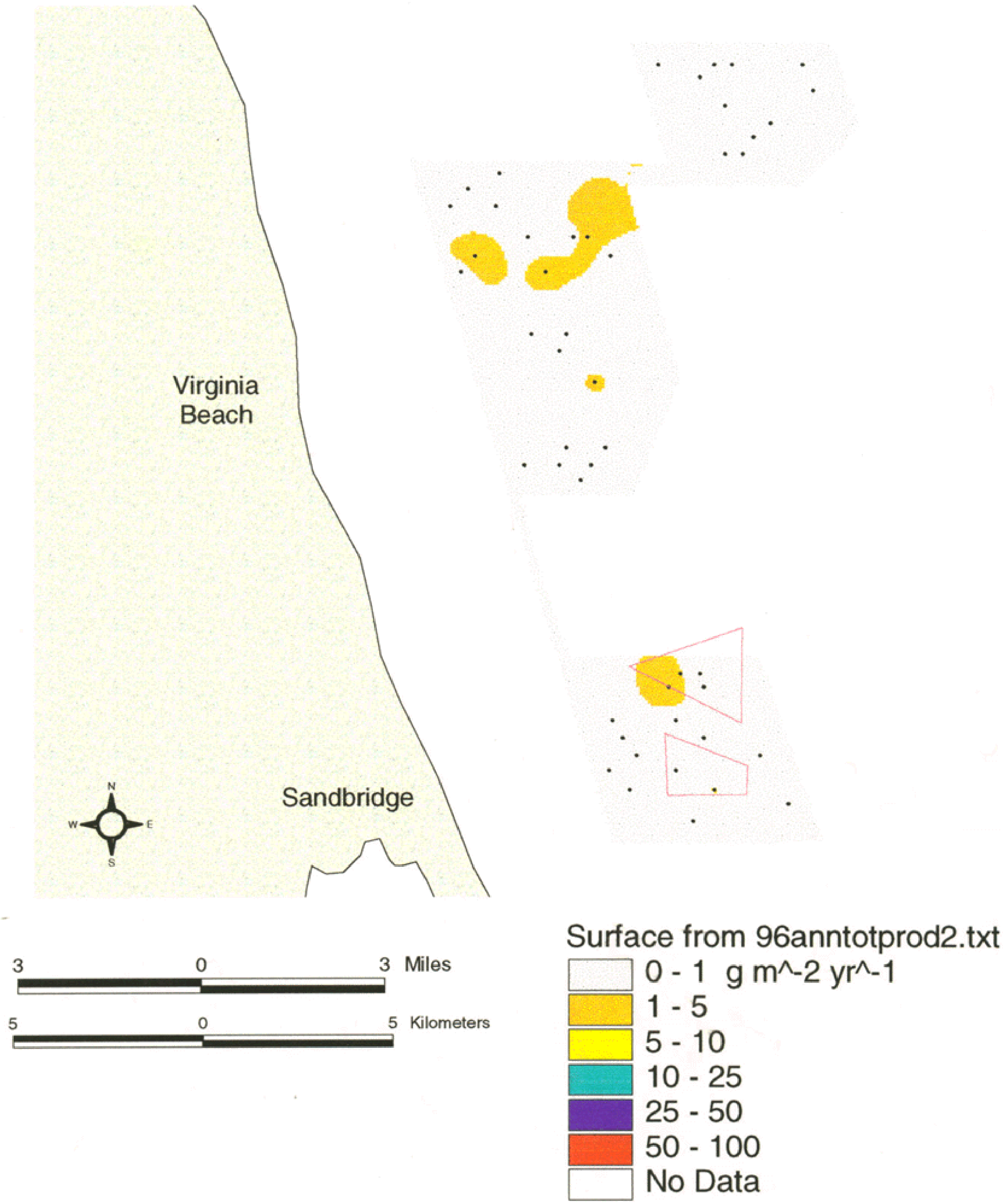


Figure 40. 1996 total annual crustacean secondary production (g m^-2 yr^-1).

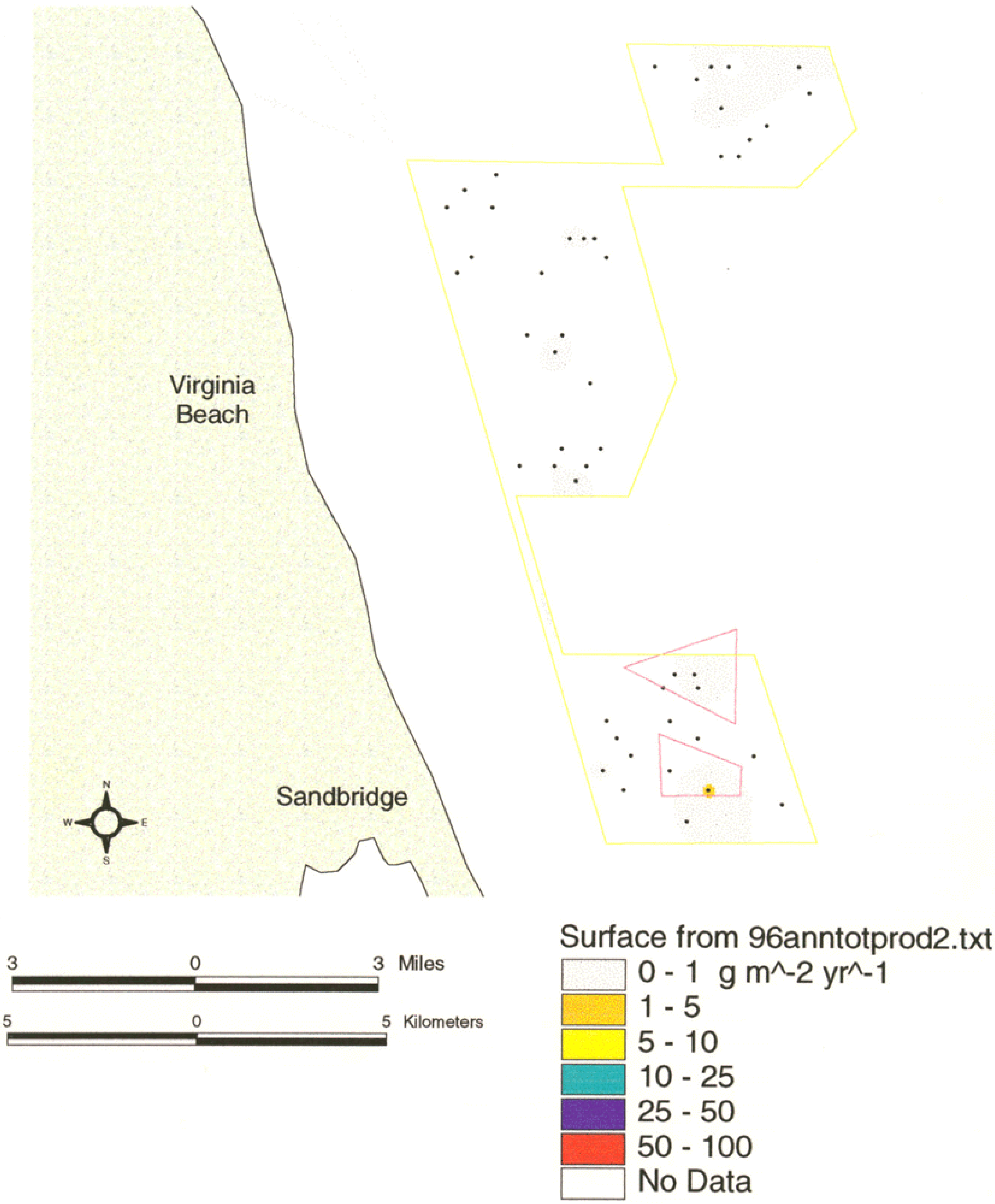


Figure 41. 1996 total annual secondary production (g m^-2 yr^-1) for miscellaneous taxa.

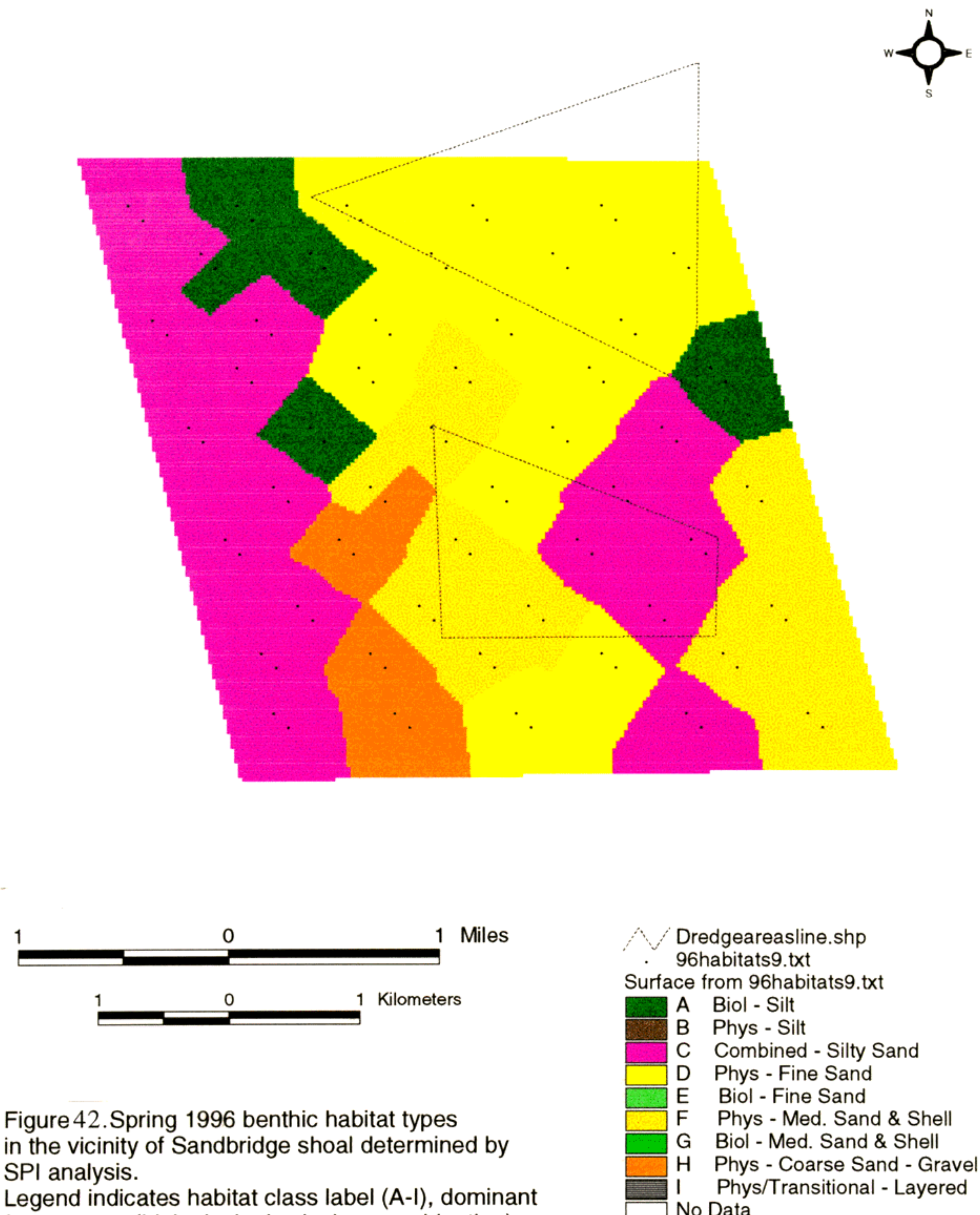


Figure 42. Spring 1996 benthic habitat types in the vicinity of Sandbridge shoal determined by SPI analysis.
Legend indicates habitat class label (A-I), dominant feature type (biological, physical, or combination), and sediment type. Primarily biological habitats are colored green hues, physical habitats are brown, yellow, and orange, and combination are violet.

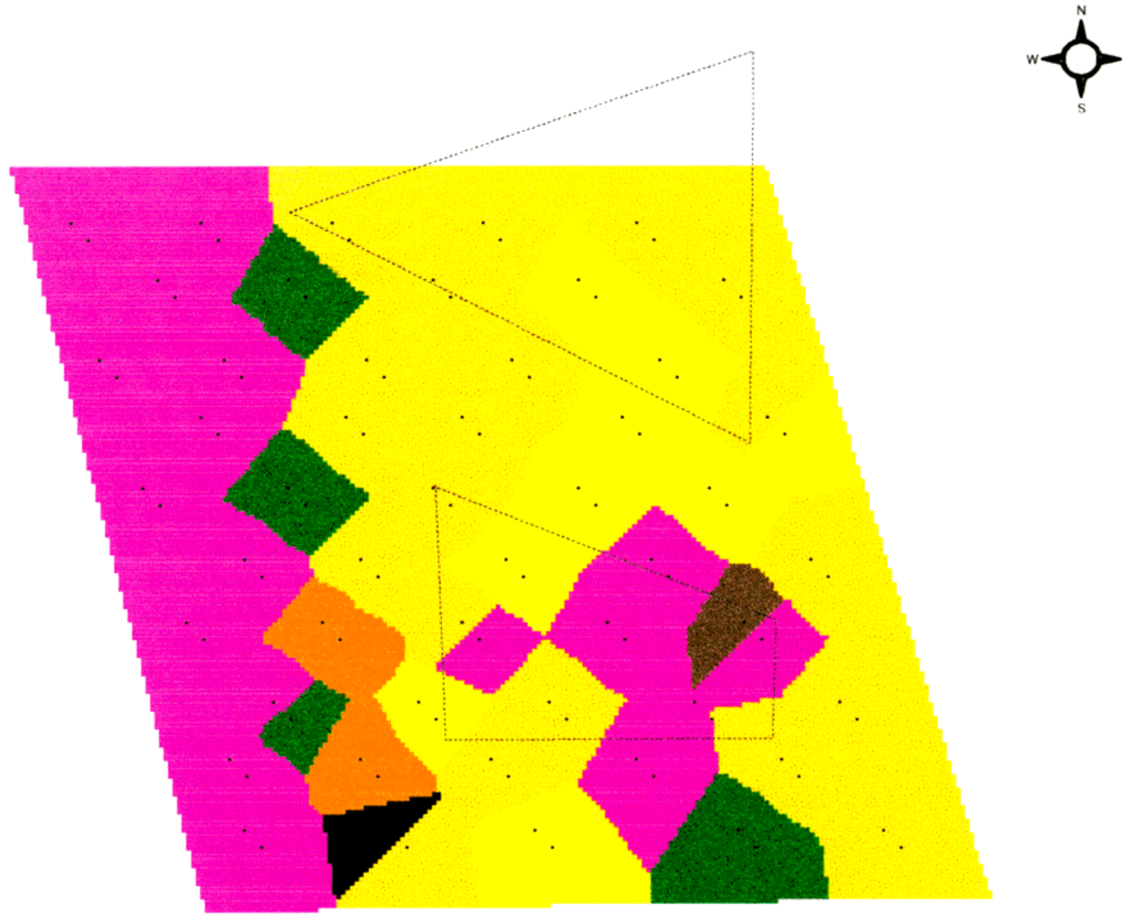


Figure 43. Fall 1996 benthic habitat types in the vicinity of Sandbridge shoal determined by SPI analysis.
Legend indicates habitat class label (A-I), dominant feature type (biological, physical, or combination), and sediment type. Primarily biological habitats are colored green hues, physical habitats are brown, yellow, and orange, and combination are violet.

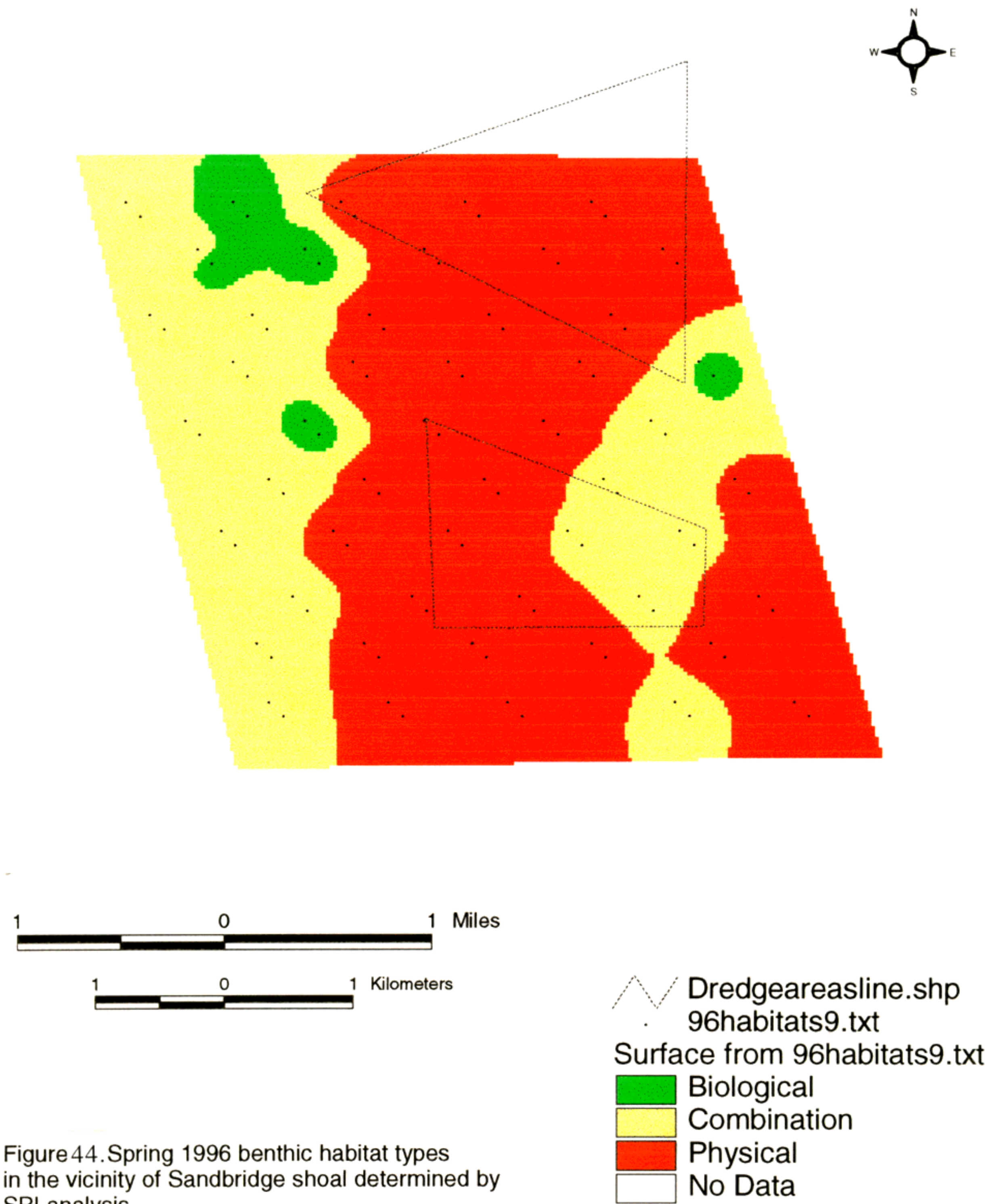


Figure 44. Spring 1996 benthic habitat types in the vicinity of Sandbridge shoal determined by SPI analysis.
Habitats are grouped in terms of physical or biological dominance of substrate characteristics, or a combination of both

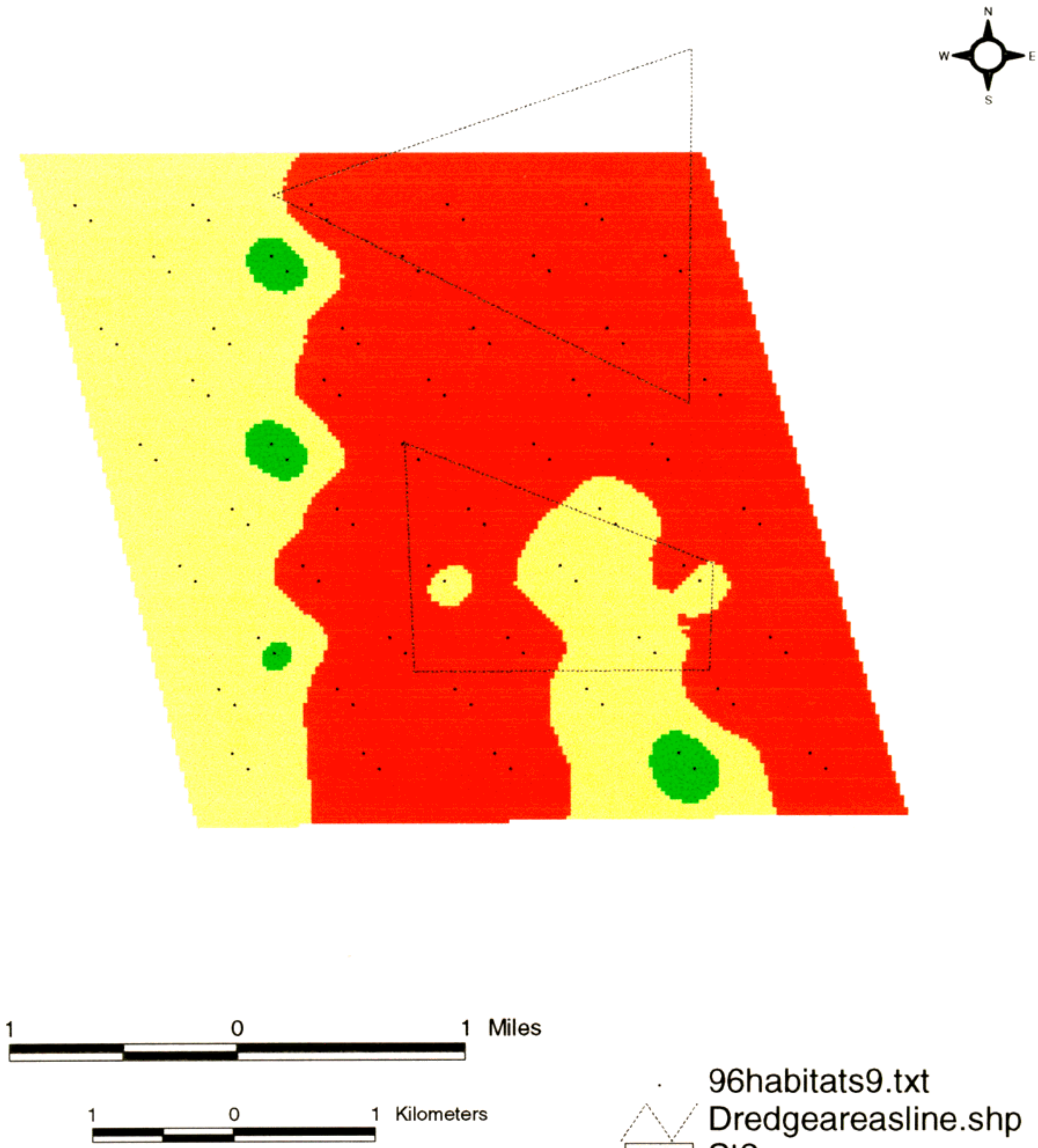


Figure 45. Fall 1996 benthic habitat types in the vicinity of Sandbridge shoal determined by SPI analysis.
Habitats are grouped in terms of physical or biological dominance of substrate characteristics, or a combination of both

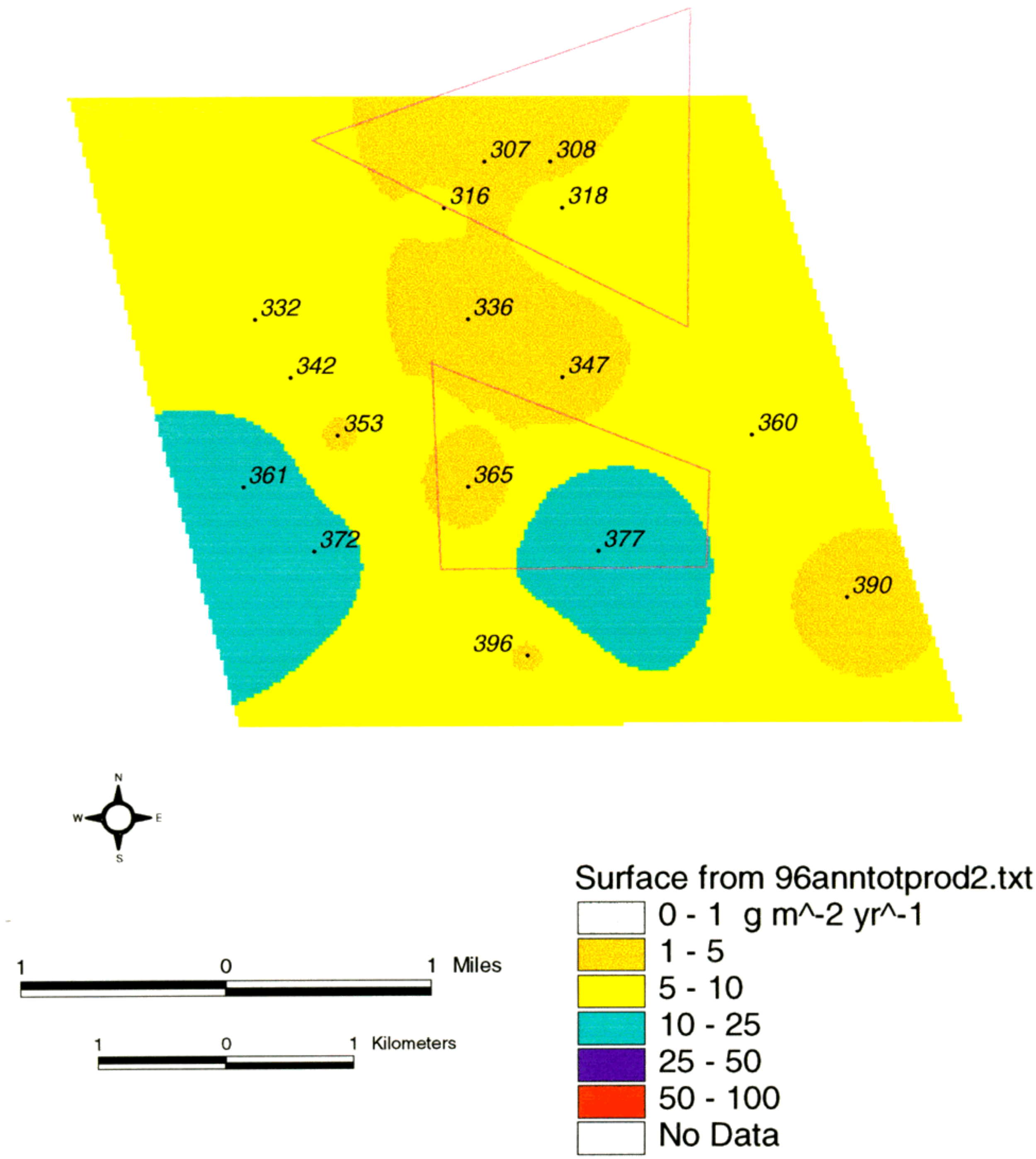


Figure 46. 1996 total annual community secondary production (g m^-2 yr^-1) in the vicinity of Sandbridge shoal and the proposed borrow areas. 1996 Cell numbers are labelled.

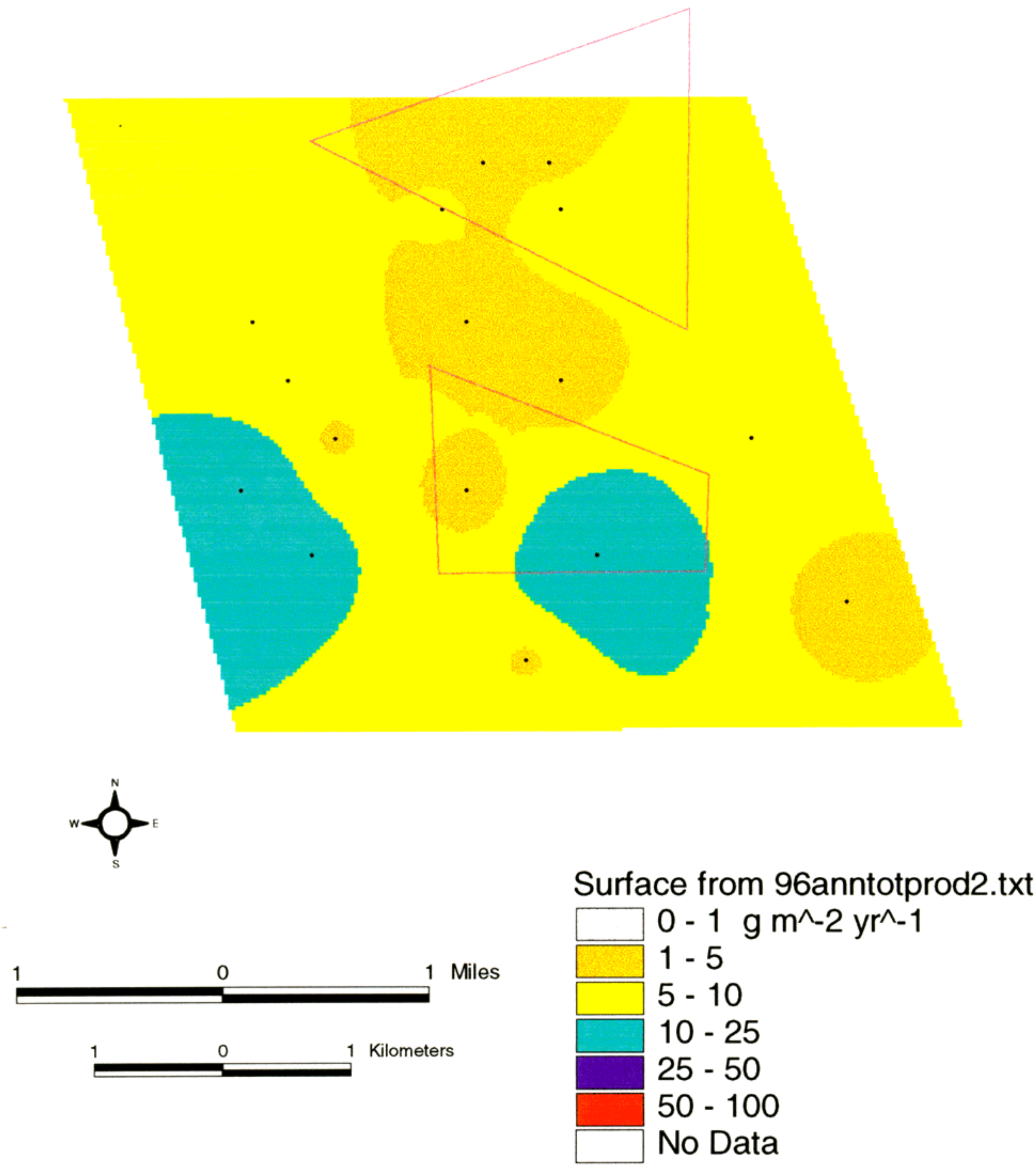


Figure 47 1996 total annual community secondary production (g m^-2 yr^-1) in the vicinity of Sandbridge shoal and the proposed borrow areas.

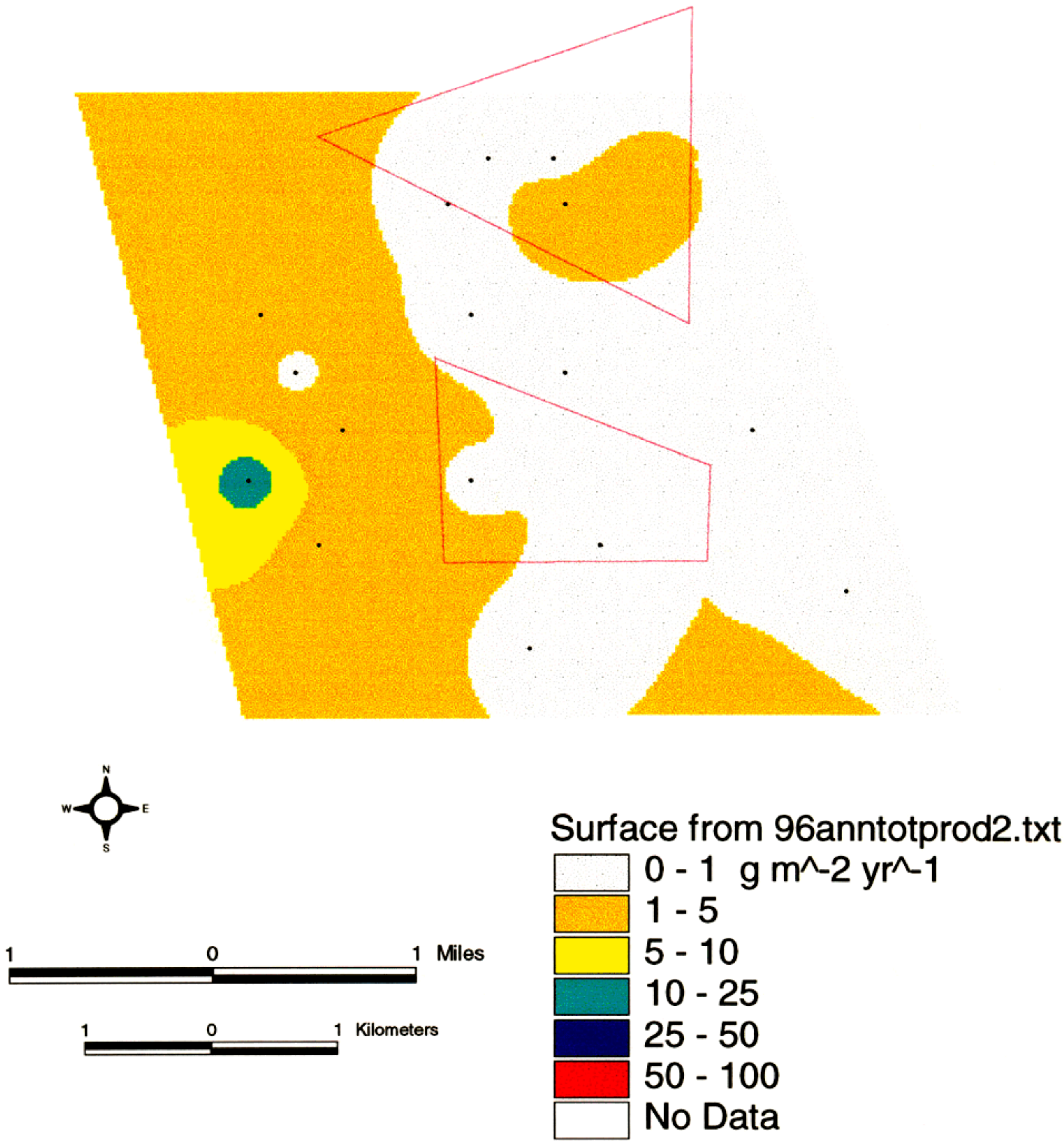


Figure 48. 1996 total annual molluscan secondary production (g m^-2 yr^-1) in the vicinity of Sandbridge shoal and the proposed borrow areas.

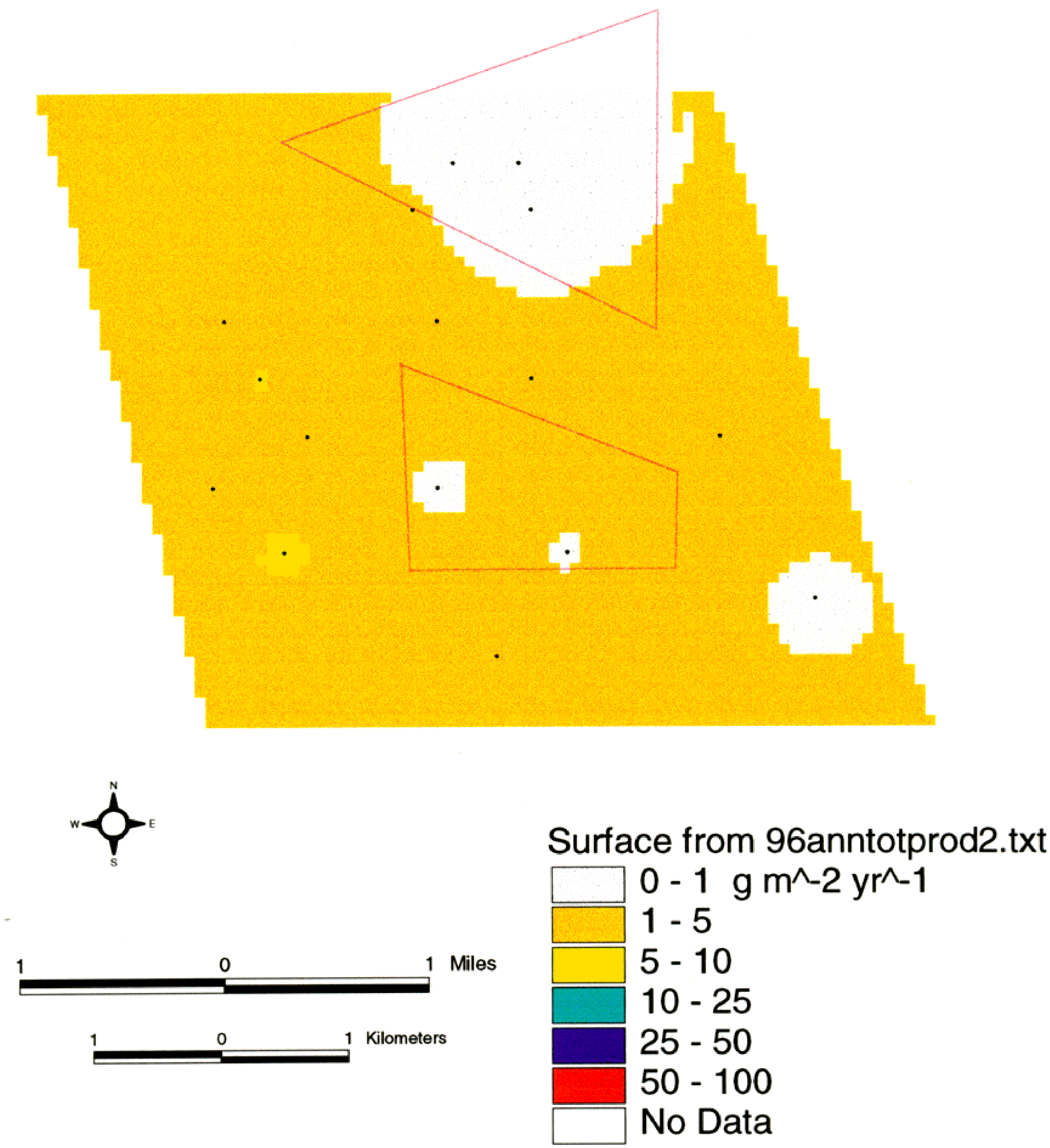


Figure 49. 1996 total annual polychaete secondary production (g m^-2 yr^-1) in the vicinity of Sandbridge shoal and the proposed borrow areas.

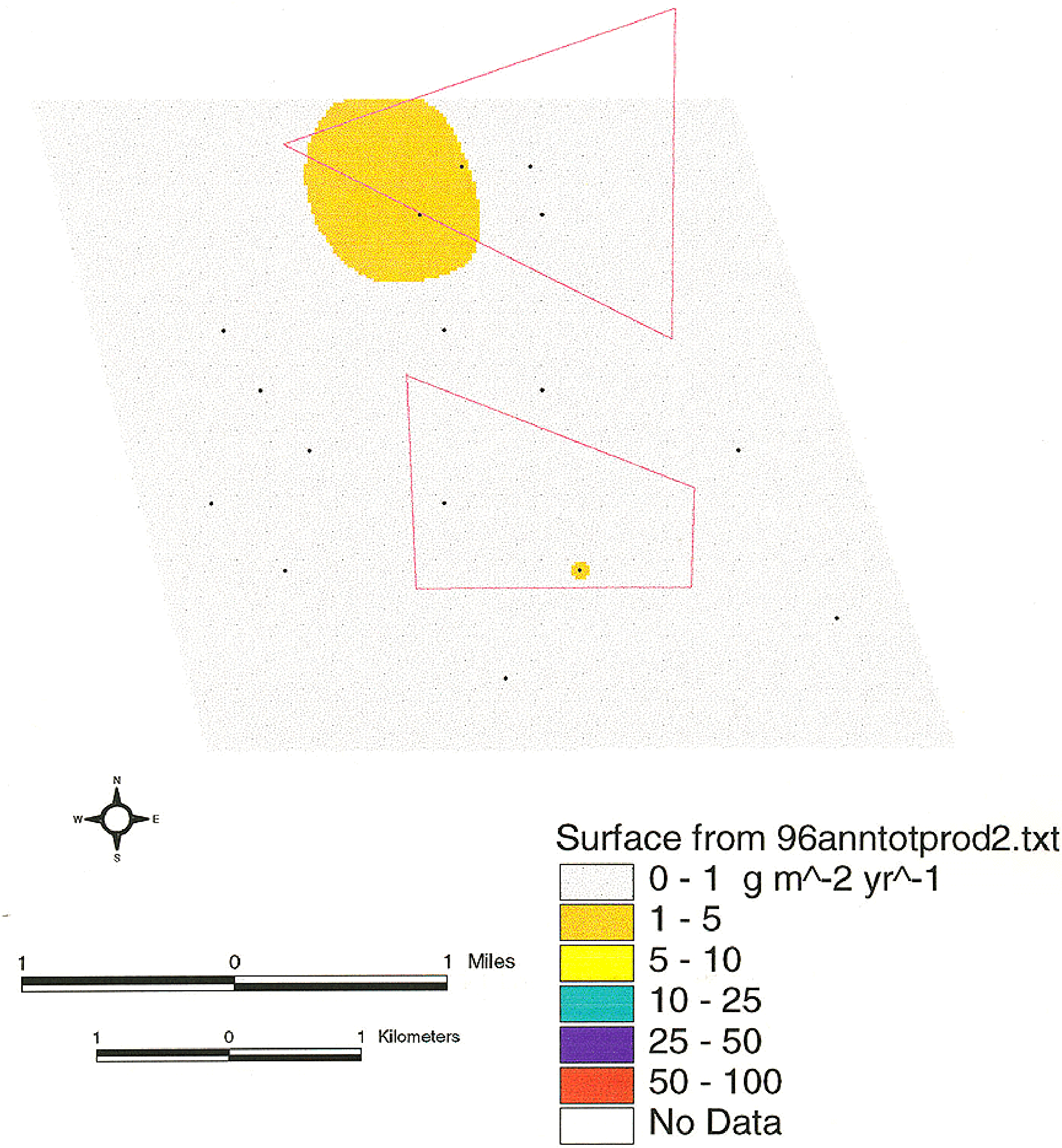


Figure 50. 1996 total annual crustacean secondary production (g m^-2 yr^-1) in the vicinity of Sandbridge shoal and the proposed borrow areas.

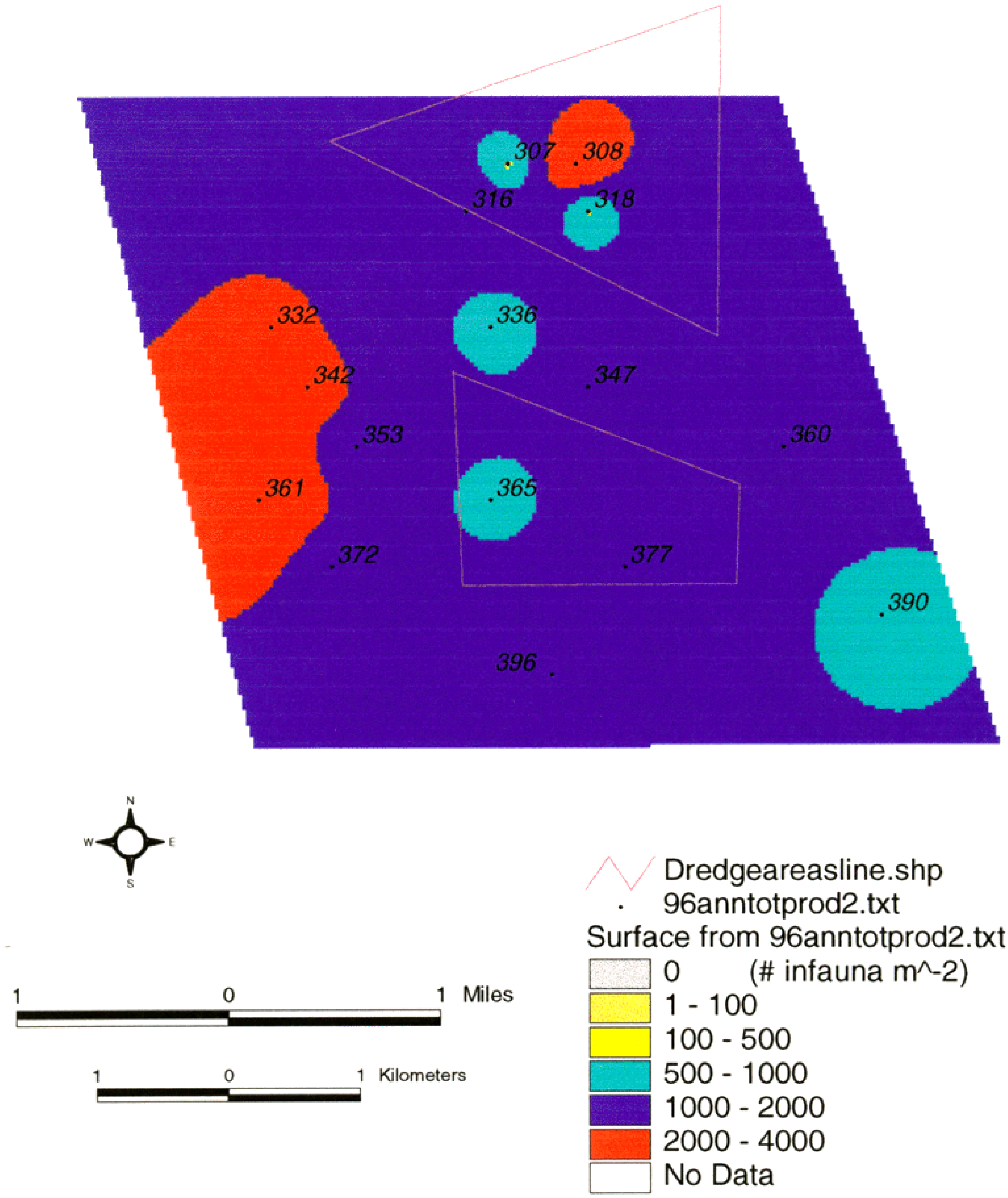


Figure 51. 1996 mean annual densities of all infauna (# m^-2) in the vicinity of Sandbridge shoal and the proposed borrow areas. Grab sample cell numbers are labelled.

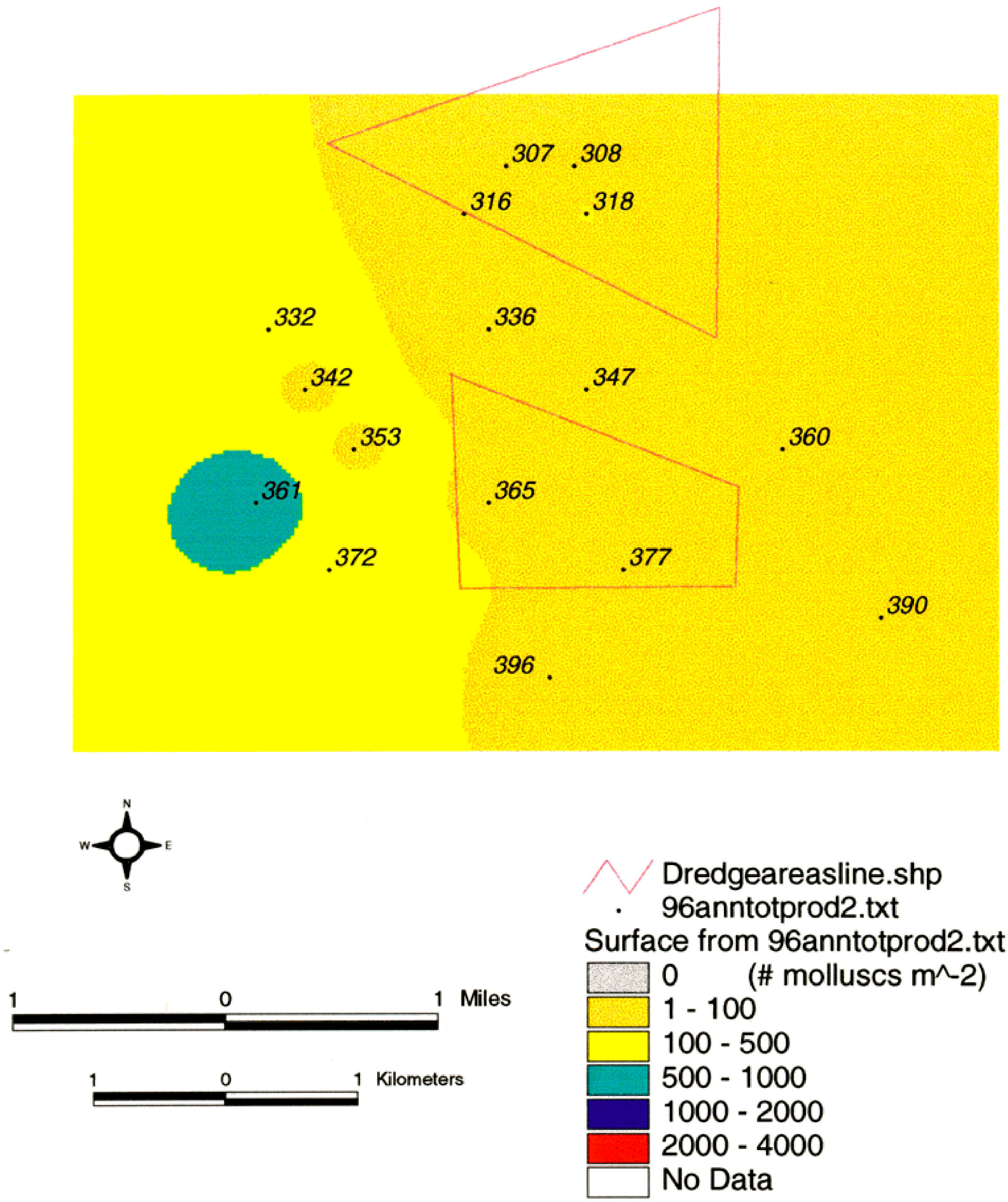


Figure 52. 1996 mean annual densities of molluscs (# m^-2) in the vicinity of Sandbridge shoal and the proposed borrow areas. Grab sample cell numbers are labelled.

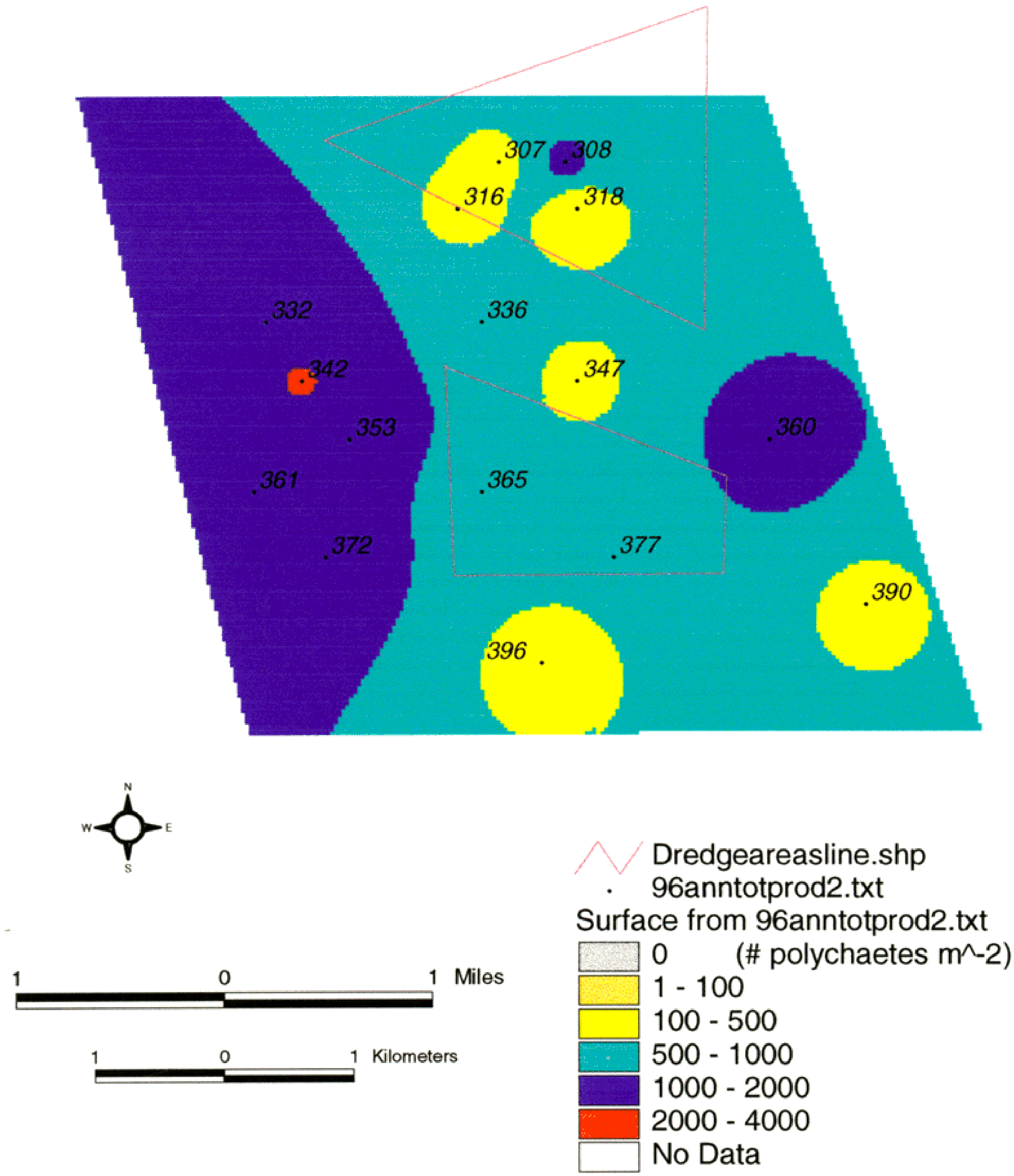


Figure 53. 1996 mean annual densities of polychaetes (# m^-2) in the vicinity of Sandbridge shoal and the proposed borrow areas. Grab sample cell numbers are labelled.

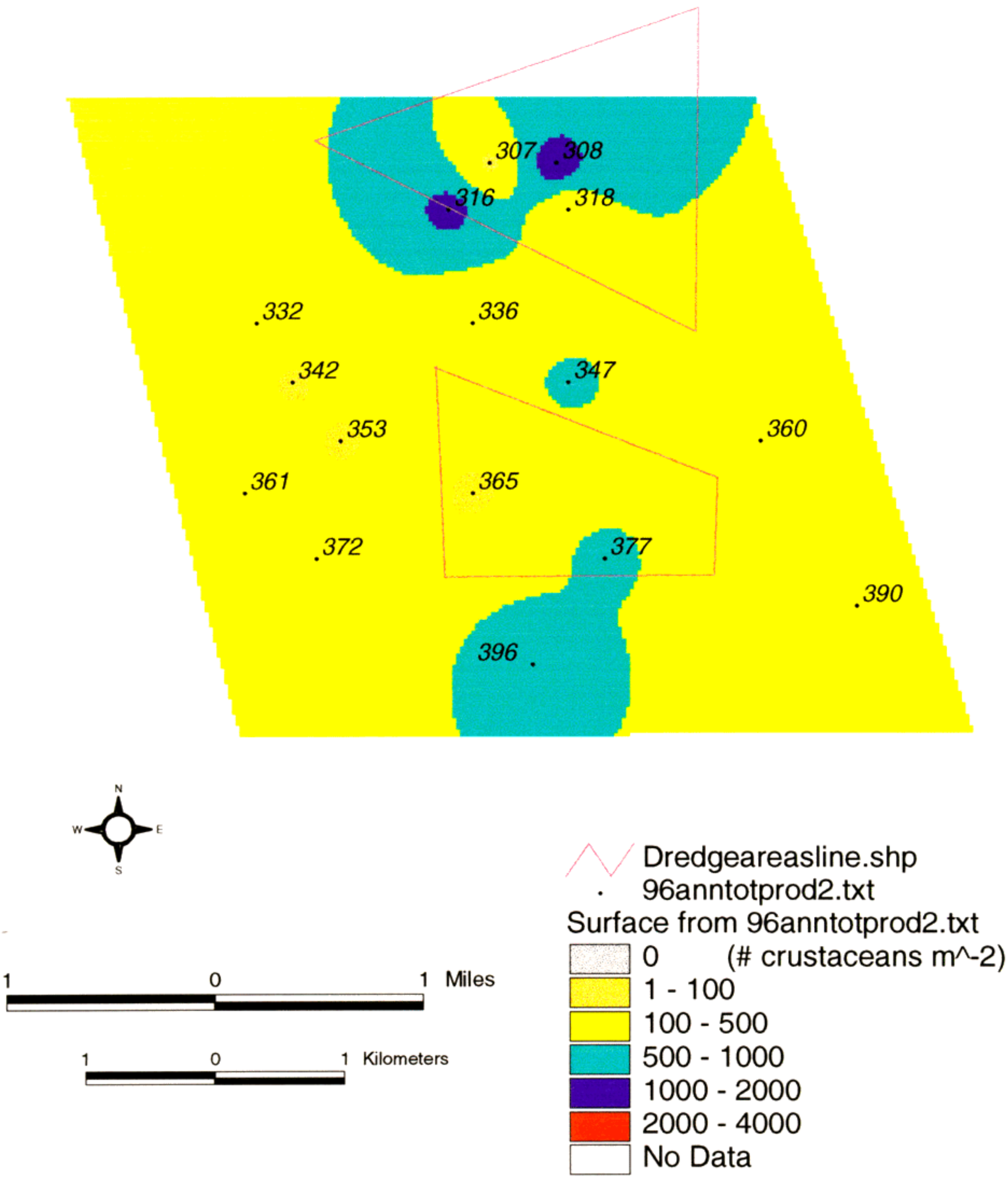


Figure 54. 1996 mean annual densities of crustaceans (# m^-2) in the vicinity of Sandbridge shoal and the proposed borrow areas. Grab sample cell numbers are labelled.

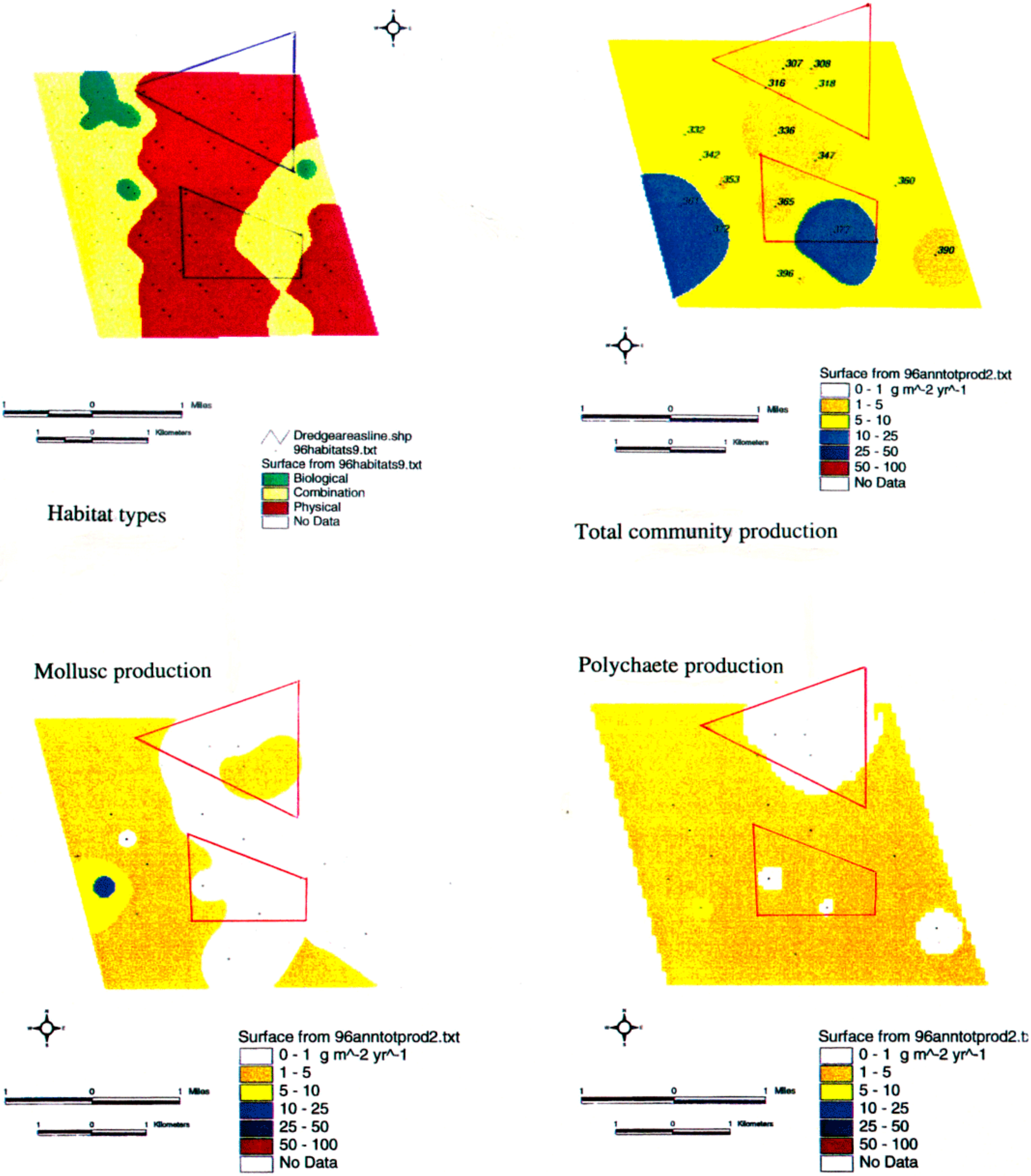


Figure 55. Comparison of gross habitat type determinations from SPI to secondary production calculated using grab data for the study area off Sandbridge, in the vicinity of the proposed borrow areas.

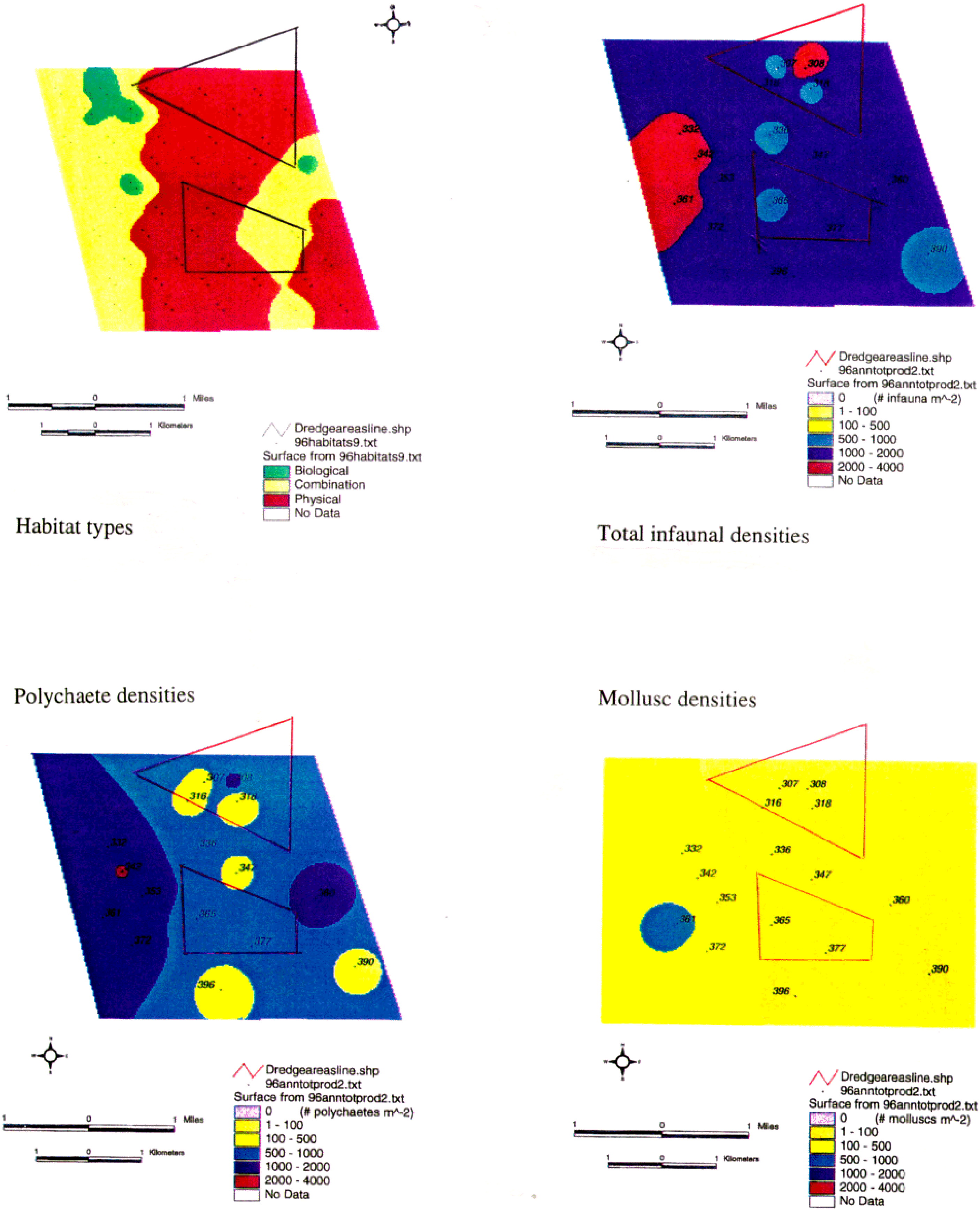


Figure 56. Comparison of gross habitat type determinations from SPI to infaunal densities from grab data for the study area off Sandbridge, in the vicinity of the proposed borrow areas.

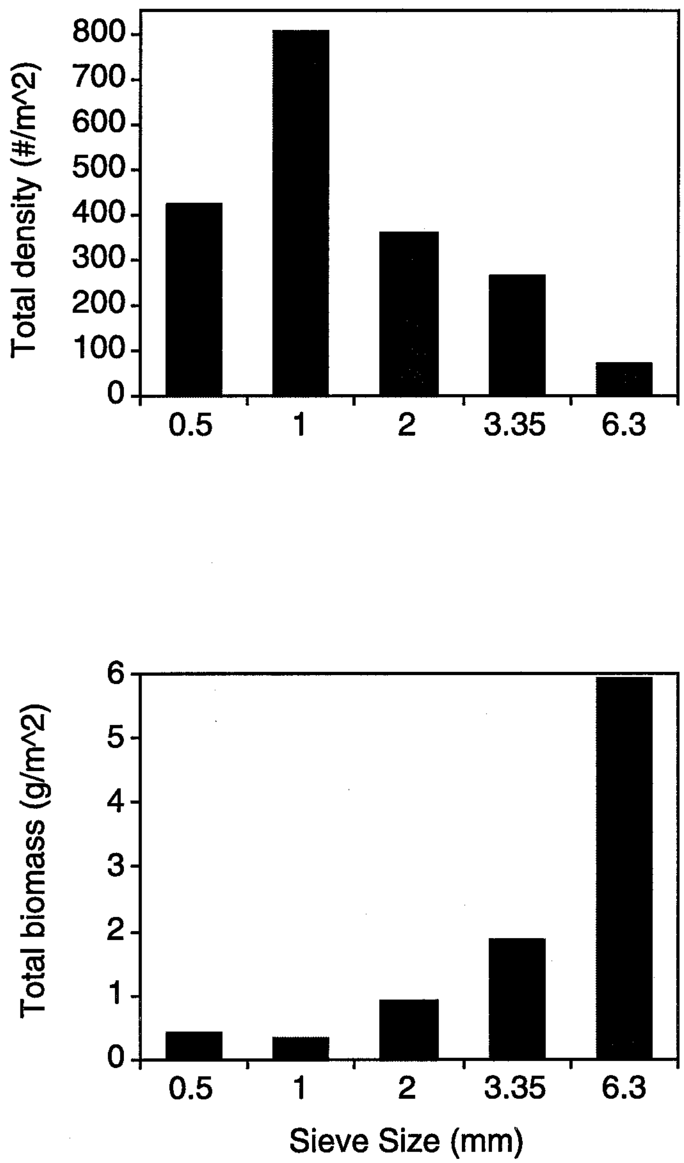


Figure 57. Size class distributions of total biomass and number of individuals per m^2 for all 1996 grab data.

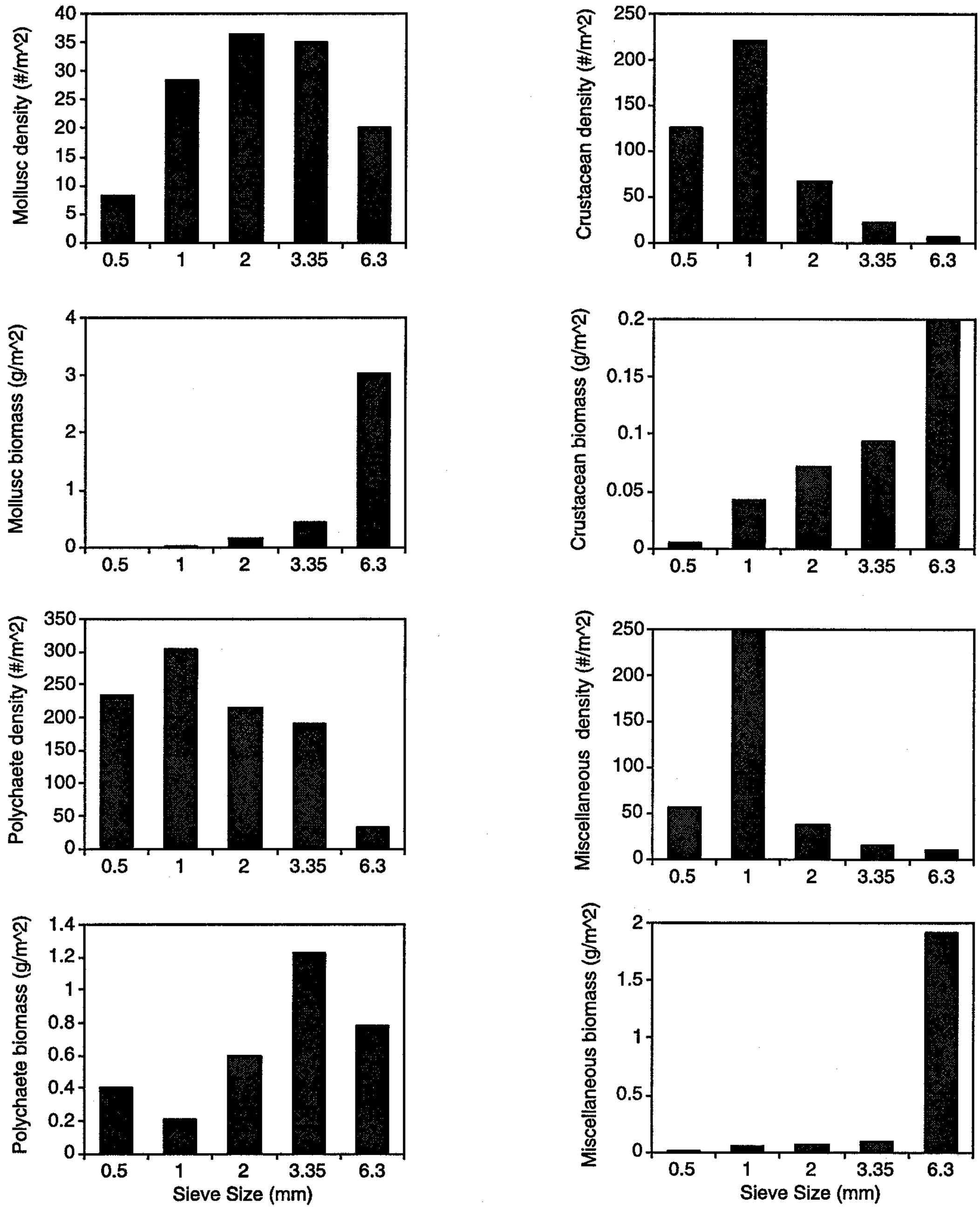


Figure 58. Size class distributions of mollusc, polychaet, crustacean, and other (miscellaneous) taxa biomass and number of individuals per m^2 for all 1996 grab data.

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
96001	2	36.883	-75.939	+		+					
96003	2	36.883	-75.932	+		+					
96005	3	36.883	-75.923	+		+	+				
96007	2	36.883	-75.915	+		+					
96009	2	36.883	-75.907	+		+					
96012	2	36.879	-75.934	+		+					
96013	4	36.878	-75.930		+		+	+			
96014	2	36.879	-75.926	+		+					
96016	2	36.879	-75.918	+		+					
96018	2	36.879	-75.910	+		+					
96020	2	36.879	-75.901	+		+					
96021	2	36.875	-75.937	+		+					
96023	2	36.875	-75.929	+		+					
96024	5	36.874	-75.923		+		+	+	+		
96025	2	36.875	-75.921			+					
96027	2	36.875	-75.912	+		+					
96029	2	36.875	-75.904	+		+					
96031	1	36.874	-75.934				+				
96032	2	36.870	-75.932	+		+					
96034	2	36.871	-75.924	+		+					
96036	2	36.871	-75.916	+		+					
96038	2	36.871	-75.908	+		+					
96040	2	36.871	-75.899	+		+					
96041	2	36.867	-75.935	+		+					
96043	2	36.867	-75.926	+		+					
96045	2	36.867	-75.918	+		+					
96047	2	36.867	-75.911	+		+					
96048	1	36.867	-75.905				+				
96049	7	36.867	-75.902	+	+	+	+	+	+		
96050	2	36.867	-75.908		+		+				
96052	3	36.863	-75.929	+		+	+				
96054	2	36.863	-75.921	+		+					
96056	2	36.863	-75.914	+		+					
96058	2	36.863	-75.904	+		+					
96060	3	36.863	-75.896	+		+	+				
96061	3	36.859	-75.932	+	+	+					
96063	2	36.859	-75.925	+		+					
96065	2	36.859	-75.916	+		+					

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
96066	5	36.858	-75.912		+		+	+	+		
96067	2	36.859	-75.908	+		+					
96069	2	36.859	-75.900	+		+					
96072	2	36.855	-75.926	+		+					
96074	2	36.855	-75.919	+		+					
96076	2	36.855	-75.911	+		+					
96078	2	36.855	-75.902	+		+					
96080	2	36.855	-75.894	+		+					
96081	2	36.851	-75.931			+					
96083	2	36.851	-75.922	+		+					
96085	2	36.851	-75.914	+		+					
96087	2	36.851	-75.906	+		+					
96089	2	36.851	-75.896	+		+					
96092	2	36.847	-75.924			+					
96094	2	36.847	-75.917	+		+					
96096	2	36.847	-75.909	+		+					
96098	2	36.847	-75.900	+		+					
96100	2	36.847	-75.891	+		+					
96101	2	36.844	-75.927			+					
96103	2	36.844	-75.920			+					
96104	5	36.843	-75.915		+		+	+	+		
96105	2	36.844	-75.911			+					
96106	5	36.843	-75.907		+		+	+	+		
96107	2	36.844	-75.904			+					
96109	2	36.844	-75.894	+		+					
96112	2	36.840	-75.922			+					
96114	2	36.840	-75.915			+					
96115	5	36.839	-75.908		+		+	+			
96116	2	36.840	-75.906			+					
96118	2	36.840	-75.898			+					
96120	2	36.840	-75.889	+		+					
96121	2	36.836	-75.925	+		+					
96123	2	36.836	-75.916	+		+					
96125	2	36.836	-75.909			+					
96127	2	36.836	-75.901			+					
96129	2	36.836	-75.892	+		+					
96132	2	36.832	-75.921	+		+					
96134	2	36.832	-75.912	+		+					
96136	2	36.832	-75.904			+					

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
96137	5	36.832	-75.900		+		+	+	+		
96138	2	36.832	-75.897			+					
96140	2	36.832	-75.886	+		+					
96141	2	36.829	-75.923	+		+					
96143	2	36.829	-75.915	+		+					
96145	2	36.829	-75.907	+		+					
96147	2	36.829	-75.898			+					
96149	2	36.829	-75.890			+					
96152	2	36.824	-75.916	+		+					
96154	2	36.824	-75.909	+		+					
96156	2	36.824	-75.901	+		+					
96158	2	36.824	-75.893			+					
96160	2	36.824	-75.884			+					
96161	2	36.820	-75.921	+		+					
96163	2	36.820	-75.914	+		+					
96165	2	36.820	-75.905	+		+					
96167	2	36.820	-75.896	+		+					
96169	2	36.820	-75.887			+					
96172	2	36.816	-75.915	+		+					
96174	7	36.816	-75.910	+	+	+	+	+	+		
96176	3	36.816	-75.898	+		+	+				
96178	2	36.816	-75.890	+		+					
96180	2	36.816	-75.882			+					
96181	4	36.812	-75.917	+	+	+	+				
96183	3	36.812	-75.909	+	+	+					
96185	7	36.812	-75.901	+	+	+	+	+	+		
96187	2	36.812	-75.893	+		+					
96189	2	36.812	-75.885			+					
96192	2	36.809	-75.912	+		+					
96194	7	36.808	-75.903	+	+	+	+	+	+		
96196	2	36.809	-75.896	+		+					
96198	2	36.809	-75.888			+					
96200	2	36.809	-75.879	+		+					
96201	7	36.908	-75.885	+	+	+	+	+	+		
96203	2	36.909	-75.877	+		+					
96204	2	36.908	-75.872		+		+				
96205	4	36.909	-75.868	+	+	+	+				
96207	2	36.909	-75.861	+		+					
96209	9	36.908	-75.851	+	+	+	+	+			

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
96212	2	36.906	-75.880	+		+					
96213	2	36.905	-75.875		+		+				
96214	2	36.906	-75.871	+		+					
96216	2	36.906	-75.863	+		+					
96218	2	36.906	-75.855	+		+					
96220	2	36.906	-75.847	+		+					
96221	2	36.903	-75.883	+		+					
96223	2	36.902	-75.875	+		+					
96225	2	36.903	-75.866	+		+					
96227	2	36.903	-75.857	+		+					
96229	4	36.903	-75.849	+	+	+	+				
96232	2	36.899	-75.878	+		+					
96234	7	36.898	-75.869	+	+	+	+	+	+		
96236	2	36.899	-75.861	+		+					
96238	2	36.899	-75.852	+		+					
96240	2	36.899	-75.844	+		+					
96241	2	36.895	-75.881	+		+					
96243	2	36.895	-75.872	+		+					
96245	2	36.895	-75.864	+		+					
96246	5	36.894	-75.858		+		+	+	+		
96247	2	36.895	-75.856	+		+					
96249	2	36.895	-75.847	+		+					
96252	2	36.891	-75.876	+		+					
96254	2	36.891	-75.867	+		+					
96255	5	36.891	-75.862		+		+	+	+		
96256	2	36.891	-75.859	+		+					
96258	2	36.892	-75.850	+		+					
96260	2	36.891	-75.841	+		+					
96261	2	36.887	-75.878	+		+					
96263	4	36.887	-75.870	+	+	+	+				
96264	2	36.887	-75.865		+		+				
96265	2	36.887	-75.861	+		+					
96267	2	36.887	-75.853	+		+					
96269	2	36.887	-75.845	+		+					
96272	2	36.883	-75.873	+		+					
96274	2	36.883	-75.864	+		+					
96276	2	36.883	-75.856	+		+					
96278	2	36.883	-75.847	+		+					
96280	2	36.883	-75.839	+		+					

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
96281	2	36.879	-75.876	+		+					
96283	2	36.879	-75.867	+		+					
96285	2	36.879	-75.859	+		+					
96287	2	36.879	-75.850	+		+					
96289	2	36.879	-75.841	+		+					
96292	2	36.875	-75.871	+		+					
96294	2	36.875	-75.862	+		+					
96296	2	36.875	-75.854	+		+					
96298	2	36.875	-75.845	+		+					
96300	2	36.875	-75.837	+		+					
96301	2	36.762	-75.904	+		+					
96303	2	36.762	-75.896	+		+					
96305	2	36.762	-75.889	+		+					
96307	3	36.762	-75.880	+	+	+					
96308	2	36.761	-75.875		+						+
96309	2	36.762	-75.871	+		+					
96312	2	36.759	-75.899	+		+					
96314	2	36.759	-75.891	+		+					
96316	8	36.758	-75.882	+	+	+	+	+	+		+
96318	3	36.759	-75.875	+	+	+					
96320	2	36.759	-75.866	+		+					
96321	2	36.754	-75.902	+		+					
96323	2	36.754	-75.895	+		+					
96325	2	36.754	-75.887	+		+					
96327	2	36.754	-75.879	+		+					
96329	2	36.754	-75.870	+		+					
96332	6	36.750	-75.896	+		+	+	+	+		
96334	2	36.751	-75.888	+		+					
96336	5	36.750	-75.881	+	+	+	+				+
96338	2	36.751	-75.872	+		+					
96340	2	36.751	-75.864	+		+					
96341	2	36.746	-75.900	+		+					
96342	1	36.746	-75.893		+						
96343	2	36.746	-75.891	+		+					
96345	2	36.746	-75.883	+		+					
96347	9	36.746	-75.874	+	+	+	+	+	+		+
96349	2	36.746	-75.867	+		+					
96352	2	36.742	-75.894	+		+					
96353	5	36.742	-75.890		+		+	+	+		

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
96354	2	36.742	-75.887	+		+					
96356	3	36.742	-75.879	+		+					+
96358	2	36.742	-75.871	+		+					
96360	3	36.742	-75.861	+	+	+					
96361	5	36.738	-75.897	+	+	+	+				+
96363	2	36.739	-75.889	+		+					
96365	7	36.738	-75.881	+	+	+		+	+		+
96367	2	36.739	-75.873	+		+					
96369	2	36.739	-75.865	+		+					
96372	5	36.737	-75.892	+	+	+	+				+
96374	2	36.734	-75.884	+		+					
96376	2	36.734	-75.876	+		+					
96377	6	36.733	-75.871		+		+	+	+		+
96378	2	36.734	-75.868	+		+					
96380	2	36.734	-75.860	+		+					
96381	2	36.731	-75.895	+		+					
96383	2	36.731	-75.887	+		+					
96385	2	36.731	-75.880	+		+					
96387	2	36.731	-75.871	+		+					
96389	2	36.731	-75.863	+		+					
96390	1	36.730	-75.854		+						
96392	2	36.726	-75.894	+		+					
96394	2	36.726	-75.886	+		+					
96396	3	36.726	-75.877	+		+	+				
96398	2	36.726	-75.866	+		+					
96400	2	36.726	-75.857	+		+					
97001	2	36.916	-75.951					+			
97002	2	36.920	-75.925					+			
97003	2	36.926	-75.900					+			
97004	2	36.926	-75.874					+			
97005	2	36.928	-75.849					+			
97006	2	36.907	-75.933					+			
97007	2	36.910	-75.908					+			
97008	2	36.913	-75.883					+			
97009	2	36.916	-75.857					+			
97011	2	36.895	-75.942					+			
97012	2	36.898	-75.917					+			
97013	2	36.901	-75.891					+			
97014	2	36.904	-75.866					+			

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
97015	2	36.906	-75.841					+			
97016	2	36.885	-75.925					+			
97017	2	36.888	-75.900					+			
97018	2	36.891	-75.874					+			
97019	2	36.911	-75.849					+			
97021	2	36.873	-75.934					+			
97022	2	36.876	-75.908					+			
97023	2	36.879	-75.883					+			
97024	2	36.881	-75.858					+			
97025	2	36.885	-75.832					+			
97026	2	36.863	-75.917					+			
97027	2	36.866	-75.891					+			
97028	2	36.869	-75.866					+			
97029	2	36.872	-75.841					+			
97031	2	36.851	-75.926					+			
97032	2	36.853	-75.900					+			
97033	2	36.856	-75.875					+			
97034	2	36.857	-75.850					+			
97035	2	36.862	-75.825					+			
97036	2	36.841	-75.909					+			
97037	2	36.844	-75.884					+			
97038	2	36.847	-75.859					+			
97039	2	36.849	-75.833					+			
97041	2	36.829	-75.917					+			
97042	2	36.831	-75.893					+			
97043	2	36.834	-75.867					+			
97044	2	36.837	-75.842					+			
97045	2	36.840	-75.818					+			
97046	3	36.819	-75.901					+	+		
97047	3	36.822	-75.876					+	+		
97048	2	36.825	-75.850					+			
97051	2	36.807	-75.910					+			
97052	2	36.809	-75.884					+			
97053	2	36.812	-75.860					+			
97054	2	36.815	-75.847					+			
97056	2	36.797	-75.893					+			
97057	2	36.800	-75.868					+			
97058	3	36.804	-75.843					+	+		
97061	2	36.785	-75.902					+			

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
97062	2	36.788	-75.877					+			
97063	2	36.791	-75.851					+			
97064	3	36.793	-75.826					+	+		
97066	3	36.775	-75.885					+	+		
97067	2	36.778	-75.859					+			
97068	2	36.781	-75.835					+			
97071	3	36.763	-75.893					+	+		
97072	2	36.765	-75.869					+			
97073	3	36.769	-75.843					+			
97074	3	36.771	-75.826					+	+		
97076	2	36.753	-75.877					+			
97077	2	36.755	-75.852					+			
97078	2	36.759	-75.826					+			
97082	2	36.745	-75.862					+			
97083	2	36.746	-75.835					+			
97084	2	36.749	-75.810					+			
97086	2	36.730	-75.868					+			
97087	2	36.733	-75.843					+			
97088	2	36.738	-75.819					+			
97091	2	36.718	-75.878					+			
97092	2	36.721	-75.852					+			
97093	2	36.724	-75.827					+			
97094	2	36.727	-75.802					+			
97096	3	36.709	-75.860					+	+		
97097	2	36.712	-75.836					+			
97098	2	36.715	-75.811					+			
97101	2	36.696	-75.869					+			
97102	2	36.699	-75.844					+			
97103	2	36.702	-75.819					+			
97104	3	36.705	-78.166					+	+		
97106	2	36.686	-75.853					+			
97107	3	36.689	-75.827					+	+		
97108	2	36.692	-75.802					+			
97205	3	36.909	-75.868					+	+		
sb001	1	36.735	-75.878							+	
sb002	1	36.732	-75.877							+	
sb003	1	36.730	-75.878							+	
sb004	1	36.745	-75.875							+	+
sb005	1	36.742	-75.875							+	

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr
sb006	1	36.738	-75.875							+	
sb007	1	36.735	-75.875							+	
sb008	1	36.732	-75.875							+	
sb009	1	36.730	-75.875							+	
sb010	1	36.745	-75.872							+	
sb011	1	36.742	-75.872							+	
sb012	1	36.739	-75.872							+	
sb013	1	36.735	-75.872							+	
sb014	1	36.733	-75.872							+	
sb015	1	36.730	-75.873							+	
sb016	1	36.745	-75.870							+	
sb017	1	36.741	-75.870							+	
sb018	1	36.738	-75.869							+	
sb019	1	36.735	-75.869							+	+
sb020	1	36.732	-75.870							+	
sb021	1	36.730	-75.870							+	+
sb022	1	36.730	-75.868							+	
sb023	1	36.732	-75.868							+	
sb024	1	36.735	-75.868							+	
sb025	1	36.738	-75.867							+	
sb026	1	36.741	-75.867							+	+
sb027	1	36.745	-75.868							+	
sb028	1	36.762	-75.884							+	
sb029	1	36.760	-75.877							+	+
sb030	1	36.759	-75.872							+	
sb031	1	36.757	-75.864							+	
sb032	1	36.757	-75.853							+	
sb033	1	36.748	-75.879							+	+
sb034	1	36.754	-75.876							+	+
sb035	1	36.762	-75.871							+	
sb036	1	36.767	-75.869							+	
sb037	1	36.772	-75.882							+	
sb038	1	36.773	-75.882							+	
sb039	1	36.766	-75.877							+	+
sb040	1	36.761	-75.873							+	
sb041	1	36.738	-75.885							+	
sb042	1	36.750	-75.898							+	+
sb043	1	36.729	-75.878							+	
sb044	1	36.718	-75.842							+	

Table 1. Spring and fall 1996 and 1997 positions.

CELL	N	LAT	-LON	SPR96spi	SPR96gr	FAL96spi	FAL96gr	SPR97spi	SPR97gr	FAL97spi	FAL97gr	
sb045	1	36.724	-75.856							+		
sb046	1	36.732	-75.839							+		
sb047	1	36.742	-75.856							+		
sb081	1	36.745	-75.885							+		
sb082	1	36.742	-75.886							+		
sb083	1	36.739	-75.884							+		
sb084	1	36.735	-75.885							+		
sb085	1	36.733	-75.885							+		
sb086	1	36.730	-75.885							+		
sb087	1	36.742	-75.883							+	+	
sb088	1	36.738	-75.883							+		
sb089	1	36.735	-75.883							+		
sb090	1	36.732	-75.883							+		
sb091	1	36.730	-75.883							+		
sb092	1	36.745	-75.880							+		
sb093	1	36.742	-75.880							+		
sb094	1	36.738	-75.880							+		
sb095	1	36.735	-75.880							+		
sb096	1	36.733	-75.880							+		
sb097	1	36.730	-75.880							+	+	
sb098	1	36.745	-75.878							+		
sb099	1	36.742	-75.878							+		
sb100	1	36.738	-75.877							+		
t2	1	36.745	-75.883							+		
BANE	1	36.739	-75.864									BANE
BANW	1	36.747	-75.883									BANW
BASE	1	36.732	-75.864									BASE
BASW	1	36.733	-75.884									BASW
BBNE	1	36.772	-75.865									BBNE
BBSE	1	36.749	-75.865									BBSE
BBW	1	36.763	-75.892									BBW

Table 2. Coordinates for proposed borrow areas off Sandbridge, Virginia.

All are NAD 1983

Borrow Area A

NE Corner	State Plane, ft.		N 3439350	E 12255330
	Lat Long	d m s	36 44 20.71403	075 51 49.29479
		d m	36 44.345	075 51.822
NW Corner	State Plane, ft.		N 3442070	E 12249483
	Lat Long	d m s	36 44 49.20672	075 53 00.17432
		d m	36 44.820	075 53.003
SE Corner	State Plane, ft		N 3436800	E 12255330
	Lat Long	d m s	36 43 55.50997	075 51 50.16946
		d m	36 43.925	075 51.836
SW Corner	State Plane, ft		N 3436802	E 12249483
	Lat Long	d m s	36 43 57.13779	075 53 01.96781
		d m	36 43.952	075 53.033

Borrow Area B

NE Corner	State Plane, ft		N 3452440	E 12254600
	Lat Long	d m s	36 46 20.41249	075 51 54.11446
		d m	36 46.340	075 51.902
Western End	State Plane, ft		N 3447250	E 12249080
	Lat Long	d m s	36 45 46.51629	075 53 03.36072
		d m	36 45.775	075 53.506
SE Corner	State Plane, ft		N 3443100	E 12254800
	Lat Long	d m s	36 44 57.92513	075 51 54.51787
		d m	36 44.965	075 51.909

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,											Surface struct.												
								Sed.	Sed.	Relief			--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna		+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)														
-75.94	36.882	1	A	2	spr	5.2	5.2	VFS-SI	1.6	BD, TUBES	+	CLAM	75	+	TRACE	0			0			0		0	
-75.93	36.882	3	B	2	spr	11			0.25		-		22	+	TRACE	4	WORM	5,7.5	0			0		0	
-75.92	36.882	5			spr	6.5			1.5		-		15		TRACE	1	WORM	1.5	0			0		0	
-75.91	36.882	7	A	2	spr	5.4			1.4																
-75.91	36.882	7	B	2	spr	7.2	5	CS	0.8	BD	-		3	-	NONE	0			0			0		0	
-75.91	36.882	9			spr	3.9			2.3		-														
-75.91	36.882	9	B	1	spr	5.8	5.8	CS	2	BD	-		0	+	NONE	0			0			0		1	OX
-75.93	36.878	12	B	2	spr	10	3	VFS-SI	0.5	BD, TUBES	-		113	+	NONE	6	WORM	1.5,4	0			0		1	OX
-75.93	36.878	14	B	2	spr	15.25			1.75		-		24	+		3	WORM	3	0			0		0	
-75.92	36.878	16	A	2	spr	9.5			1		-		67	+		6	WORM	3	0			0		0	
-75.91	36.878	18	A	2	spr	4.2			4																
-75.91	36.878	18	B	1	spr	6.3	2.6	VFS-SI	3	BD, TUBES	-		8	+	TRACE	2	WORM	2,4	0			0		0	
-75.9	36.878	20	A	2	spr	4.7			1																
-75.9	36.878	20	B	2	spr	7.2	7.2		0.7		-		3	+	TRACE	0			0			0		0	
-75.94	36.874	21	B	2	spr	7			2		-		17	-	TRACE	0			0			0		0	
-75.93	36.874	23	B	2	spr	11			1.25		-		76	IND		2	WORM	3,8.5	0			0		0	
-75.92	36.874	25	B	2	spr	10			6		-			IND	TRACE	0			0			0		0	
-75.91	36.874	27	B	2	spr	8			1.75		-			IND	TRACE	0			0			0		0	
-75.9	36.874	29			spr	6.5			1.7					IND	TRACE	0			0			0		0	
-75.93	36.87	32	B	2	spr	11	2	VFS-SI	0.3	BD, TUBES	-		18	+	TRACE	5	WORM	2.5,3	0			0		0	
-75.92	36.87	34	B	2	spr	7			5.25		-		1	IND					0			0		0	

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,											Surface struct.												
								Sed.	Sed.	Relief			--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna		+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)														
-75.92	36.87	36	B	2	spr	11.75			2.75		-		0	+					0			0		0	
-75.91	36.87	38	A	2	spr	7			3		-		2	+	TRACE	1	WORM	6.75	0			0		0	
-75.9	36.87	40	B	2	spr	4			1.8		-		0	+	TRACE	1	WORM	4	0			0		0	
-75.93	36.867	41	B	2	spr	4	4	VFS-FS	0.3	BD, TUBES	-		4	-	TRACE	0			0			0		0	
-75.93	36.867	43	B	2	spr	13.5	9	FS	1.2	BD, TUBES	+	GAST	1	-	NONE	0			0			0		1	OX
-75.92	36.867	45			spr	9.5			2.5		-		1	IND	TRACE	0			0			0		0	
-75.91	36.867	47			spr	6.75			1.5		-		0	+	1	1	UNID	1	0			0		0	
-75.9	36.867	49	B	2	spr	9.25			1.5		-		4	+	TRACE	0			0			0		0	
-75.93	36.862	52	B	2	spr	13	4	SI-VFS	1	BD, TUBES	-		37	+	TRACE	4	WORM	3,5,9	0			0		0	
-75.92	36.862	54	B	2	spr	10	10	MS	5	BD	-		0	-	NONE	0			0			0		0	
-75.91	36.862	56	B	2	spr	7			4		+		2	+	TRACE	0			0			0		0	
-75.9	36.862	58	B	2	spr	5.75			0.25		+		1	+	TRACE	0			0			0		0	
-75.93	36.862	60	B	2	spr	5.7			1.7		-		0	+	TRACE	0			0			0		0	
-75.92	36.858	63	B	2	spr	11	2.1	FS	0.8	BD, TUBES	-		18	+	TRACE	1	WORM	5	0			0		1	OX
-75.92	36.858	65	B	2	spr	8	8	FS-MS	2	BD, DEBRIS	-		0	-	TRACE	0						0		0	
-75.91	36.858	67	B	2	spr	10			2.5		-		0	IND	0	0			0			0		0	
-75.9	36.858	69	B	2	spr	9.5			0.5		-		2	+	TRACE	0			0			0		0	
-75.93	36.854	72	B	2	spr	5	2	FS	0.5	BD, TUBES	-		30	+	TRACE	0			0			0		0	
-75.92	36.854	74	B	2	spr	10	10	MS	4.6	BD	-		0	-	TRACE	1	WORM	0.8	0			0		0	
-75.91	36.854	76	B	2	spr	6.5	6.5	FS	1.9	BD	-		0	-	TRACE	0			0			0		0	
-75.9	36.854	78	B	2	spr	19			1		-		38	+		3	WORM	3,6,1	0			0		0	

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,											Surface struct.												
								Sed.	Sed.	Relief			--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna		+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)														
-75.89	36.854	**80**	B	2	spr	7			0.25		+		0	IND	TRACE	0			0			0		0	
-75.92	36.851	**83**	B	2	spr	18	0.7	SI	3.5	BD, TUBES	-		8	-	NONE	5	WORM	5,9,1	0			0		1	OX
-75.91	36.851	**85**	B	2	spr	10	10	MS	2.8	BD	-		0	-	NONE	0			0			0		0	
-75.91	36.851	**87**	B	2	spr	8.8	4.3	FS	1	BD	-		1	-	NONE	0			0			0		0	
-75.9	36.851	**89**	B	2	spr	8			4.25		-		0	-	TRACE	2	WORM	3,3	0			0		0	
-75.92	36.847	**94**	B	2	spr	7	7	FS-MS	1.7	BD	-		2	-	TRACE	0			0			0		0	
-75.91	36.847	**96**	B	2	spr	6	6	FS	1.5	BD, TUBES	-		4	+	1	0			0			0		0	
-75.9	36.847	**98**	B	2	spr	6.5	6.5	FS	1.3	BD, SHELL	+	GAST	0	-	TRACE	0			0			0		0	
-75.89	36.847	**100**	B	2	spr	5			1		-		2		TRACE	0			0			0		0	
-75.89	36.843	**109**	B	1	spr	4.3	4.3	FS	0.5	BD	-		0	-	NONE	0			0			0		0	
-75.89	36.839	**120**	B	2	spr	10	1		1		-		0	-	NONE	0			7	6OX,1AN	2.2,4.	0		0	
-75.92	36.836	**121**			spr	5.8			4																
-75.92	36.836	**123**	A	2	spr	4			1.1																
-75.92	36.836	**123**	B	2	spr	5.1	1.6	FS	0.9	BD, SHELL	-		0	-	TRACE	0			0			0		0	
-75.92	36.832	**132**			spr	3			1.5																
-75.91	36.832	**134**	A	2	spr	6.2	6.2	FS	0.3	BD	-		0	-	NONE	0			0			0		0	
-75.91	36.832	**134**	B	2	spr	7.3			0.6																
-75.89	36.832	**140**	A	2	spr	6.2	6.2		1.1		-		0	-	TRACE	0			0			0		0	
-75.92	36.828	**141**			spr	4			1.9																
-75.91	36.828	**143**	A	2	spr	1.5			2.8																
-75.91	36.828	**143**	B	2	spr	6	2	SI-FS	2.3	BD, TUBES	-		13	-	1	2	WORM	2,2	0			0		0	

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 1											Surface struct.												
								Sed.	Sed.	Relief			--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna		+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)														
-75.91	36.828	145	A	2	spr	6	6	FS-MS	3	BD	-		0	-	NONE	0			0			0		0	
-75.92	36.824	152	A	2	spr	2.9			2.9																
-75.91	36.824	154	A	2	spr	4.3			3																
-75.91	36.824	154	B	2	spr	5	5		2.2		-		0	-	TRACE	0			0			0		0	
-75.9	36.824	156	A	2	spr	2.8			2.5																
-75.9	36.824	156	B	2	spr	6.7	6.7		1.3		-		0	-	TRACE	0			0			0		0	
-75.92	36.82	161	A	2	spr	3.5			1.6																
-75.91	36.82	163	A	2	spr	1.5			2																
-75.9	36.82	165	A	2	spr	0.9			2.4																
-75.9	36.82	165	B	2	spr	5.2	5.2	FS	2.1	BD	-		0	-	TRACE	0			0			0		0	
-75.9	36.82	167	A	2	spr	6.2			1.4																
-75.9	36.82	167	B	2	spr	8.4	8.4	MS-CS	1.4	BD	-		0	-	TRACE	0			0			0		0	
-75.91	36.816	172	A	2	spr	4.7			2.2																
-75.91	36.816	174	A	2	spr	3			1.4																
-75.9	36.816	176	A	2	spr	4.3			1.3																
-75.9	36.816	176	B	2	spr	6.9	6.9	FS	1.9	BD	+	GAST	0	-	NONE	0						0		0	
-75.89	36.816	178	A	2	spr	4.8			0.6																
-75.89	36.816	178	B	2	spr	7.3	7.3	FS	0.6	BD, TUBES	-		5	-	NONE	1	WORM	1	1	OX	2.5	0		0	
-75.92	36.812	181	A	2	spr	3.3			2.4																
-75.91	36.812	183	A	2	spr	4.5			1.5																
-75.9	36.812	185	A	2	spr	8.6			1.8																

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,											Surface struct.												
								Sed.	Sed.	Relief			--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna		+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)														
-75.89	36.812	187	A	2	spr	3.7			1.3																
-75.89	36.812	187	B	2	spr	6.2	4.5	FS	1.1	BD	+	GAST	0	-	NONE	0			0			0		0	
-75.9	36.808	194	A	2	spr	6.2			1																
-75.9	36.808	196	A	2	spr	2.3			1.5																
-75.89	36.908	201	1		spr	3.5	1	F-MS	2.5	BD	N		Y	N	1	0			0			0		0	
-75.89	36.908	201	2		spr	4.5	1.5	F-MS	2	BD	N		N	N	1	0			0			0		0	
-75.88	36.908	203	1		spr	3.5	1.5	F-MS	2	BD	N		N	N	1	0			0			0		0	
-75.88	36.908	203	2		spr	7	1.5	F-MS	1	BD	Y?		Y	N	1	1?	?	3	0			0		IND	
-75.87	36.908	204	1		spr	2.5	ALL	F-MS	1.5	BD	N		N	N	0.5	0			0			0		0	
-75.87	36.908	205	1		spr	3	1	F-MS	1.25	BD	N		N	N	0.25	0			0			0		1?	OX
-75.87	36.908	205	2		spr	2.5	1	F-MS	1.25	BD, SH, TUBE	1, HC		Y, 1	N	0.5	0			0			0		0	
-75.86	36.908	207	1		spr	3.75	1	F-MS	1	BD	N		Y	N	1	1?	WORM?		3.5			0		0	
-75.86	36.908	207	2		spr	5.5	1	F-MS	1.5	BD	N		N	N	1	0			0			0		1	OX
-75.85	36.908	209	1		spr	1.5	ALL	F-MS	0.5	BD, BIO	KU		N	N	0.5	0			0			0		0	
-75.85	36.908	209	2		spr	2.75	0.5	FS	1.5	BD	N		N	N	0.25	0			0			0		IND	
-75.85	36.908	209	3		spr	4.5	0.5	FS	0.5		N		Y	N	1	0			0			0		IND	
-75.88	36.905	212	1		spr	4	1.5	F-MS	1.5	BD	N		N	N	0.5	0			0			0		0	
-75.88	36.905	212	2		spr	4	1.5	F-MS	2	BD	?		N	N	0.5	0			0			0		0	
-75.87	36.905	214	1		spr	5	1	F-MS	1.5	BD	N		N	N	1	0			0			0		0	
-75.87	36.905	214	2		spr	4	1	F-MS	2	BD	N		Y*	N	1	0			0			0		0	
-75.86	36.905	216	1		spr	3.5	ALL	F-MS	2	BD	N		N	N	0.5	0			0			0		0	

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,									Surface struct.												
							Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
				Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep	96	(cm)	(cm)		(cm)		(+/-)													
-75.86	36.905	**216**	1	spr	2.5	1	F-MS	1	BD,PT?	N	N	Y?	0.5	0			0			0		0	
-75.86	36.905	**216**	2	spr	2.25	0.5	F-MS	0.5		N	Y,1	N	0.5	0			0			0		0	
-75.85	36.905	**220**	1	spr	3.5	2	F-MS	1.25	BD,SH,CL	N	N?	N	0.25	0			0			0		0	
-75.85	36.905	**220**	2	spr	3.5	2	F-MS	1.25	BD	N	N	N	0.5	1?	WORM?	2	0			0		0	
-75.88	36.902	**221**	3	spr	<1	NA	F-MS	NA	BD,SH	N	N	N	NA	NA			NA			0		0A	
-75.87	36.902	**223**	1	spr	4	1.5-2	F-MS	3	BD	N	Y*	N	0.5	0			0			0		0	
-75.87	36.902	**223**	2	spr	6	1.5-2	F-MS	2	BD	N	N	N	0.25	0			0			0		0	
-75.87	36.902	**223**	3	spr	4	2	F-MS	2.5	BD	N	N	N	0.25	0			0			0		0	
-75.87	36.902	**225**	1	spr	4.5	1.5-2	F-MS	2.5	BD	N	N	N	0.5	0			0			0		0	
-75.87	36.902	**225**	2	spr	3.5	1-1.5	F-MS	1.5	BD	N	Y*	N	1	0			0			0		0	
-75.86	36.902	**227**	1	spr	3	2-ALL	F-MS	0.25		N	N	N	0.5	0			0			0		0	
-75.86	36.902	**227**	2	spr	3.5	1.5	F-MS	0.5		N	Y	N	1	0			0			0		0	
-75.85	36.902	**229**	1	spr	3.25	0.5	F-MS	<.5	SH,CL	N	N	N	1	0			0			0		0	
-75.85	36.902	**229**	2	spr	3	0.5	F-MS	0.5	BD,SH	N	N	N	0.5	0			0			0		2	
-75.88	36.898	**232**	1	spr	3.5	1-1.5	F-MS	1.5	BD	N	N	N	0.5	0			0			0		0	
-75.88	36.898	**232**	2	spr	6	1-1.5	F-MS	1	BD	N	N	N	1	0			0			0		0	
-75.88	36.898	**232**	3	spr	4	1.5	F-MS	2	BD	N	N	N	0.25	0			0			0		0	
-75.87	36.898	**234**	1	spr	4	1-1.5	F-MS	1	BD	N	N	N	0.25	0			0			0		0	
-75.87	36.898	**234**	2	spr	3.5	1-1.5	F-MS	2	BD	N	N	N	0.25	0			0			0		0	
-75.86	36.898	**236**	1	spr	4	1.5	F-MS	2	BD	N	N	N	0.25	0			0			0		0	
-75.86	36.898	**236**	2	spr	3.5	2	F-MS	1.5	BD	N	N	N	0.5	0			0			0		0	

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,								Surface struct.													
							Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
				Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep	96	(cm)	(cm)		(cm)		(+/-)													
-75.86	36.898	236	3	spr	3	1.5	F-MS	1	BD	N	N	N	0.25	0			0			0		0	
-75.85	36.898	238	1	spr	5	1.25	F-MS	0.25		N	Y	N	0.5	2	WORM		0			0		1	OX
-75.85	36.898	238	2	spr	3.75	1	F-MS	0.3		N	Y,1	N	0.5	0			0			0		0	
-75.84	36.898	240	1	spr	3.5	2-ALL	F-MS	1	BD,SH,CL	N	N	N	1	0			0			0		0	
-75.84	36.898	240	2	spr	4	2-ALL	F-MS	2	BD	N	Y	N	0.5	0			0			0		0	
-75.87	36.894	243	1	spr	4	1.5-2	F-MS	1.75	BD	N	N	N	0.5	0			0			0		0	
-75.87	36.894	243	2	spr	5.5	1.5	F-MS	1.5	BD	N	1	N	0.5	0			0			0		0	
-75.86	36.894	245	2	spr	4	1.5-2	F-MS	3	BD	N	N	N	0.5	0			0			0		0	
-75.86	36.894	247	1	spr	3.5	2.5	F-MS	2	BD	N	N	N	0.5	0			0			0		0	
-75.86	36.894	247	2	spr	3.5	2	F-MS	2.5	BD	?,UNID	N	N	0.5	0			0			0		0	
-75.85	36.894	249	1	spr	3.5	1.5	F-MS	1.5	BD	N	Y?	N	1	0			0			0		0	
-75.85	36.894	249	2	spr	3.5	2	F-MS	1.5	BD	N	Y?	N	1	0			0			0		0	
-75.88	36.891	252	1	spr	5.5	2-2.5?	F-MS	0.5		N	N	N	1	0			3	SMALL,OX,AN		0		1	ACTIVE
-75.88	36.891	252	2	spr	3	1-1.5?	F-MS	0.5		N	Y?,1	N	0.5	0			0			0		0	
-75.87	36.891	254	1	spr	6	1.5-2	F-MS	1.5	BD	N	1	N	0.5	0			0			0		0	
-75.87	36.891	254	2	spr	6	1.5-2	F-MS	1	BD	N	N	N	0.5	0			0			0		0	
-75.86	36.891	256	1	spr	4	2	F-MS	3	BD	N?	N	N	0.5	0			0			0		0	
-75.86	36.891	256	2	spr	3.5	1.5-2	F-MS	2	BD	Y?	N	N	0.25	0			0			0		0	
-75.85	36.891	258	1	spr	3.5	1.5	F-MS	1.8	BD	N	N	N	0.5	0			0			0		0	
-75.85	36.891	258	2	spr	3.5	2	F-MS	0.8		N	?	N	0.5	0			0			0		0	
-75.85	36.891	258	3	spr	3	1.5	F-MS	2	BD	N	N	N	1	0			0			0		0	

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, :											Surface struct.												
								Sed.	Sed.	Relief			--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna		+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)														
-75.84	36.891	260	1		spr	4	2	F-MS	1.5	BD	N?		N	N	1	0			0			0		0	
-75.84	36.891	260	2		spr	3.5	1.5	F-MS	1.5	BD	N?		N	N	0.5	1?	WORM		1			0		0	
-75.88	36.887	261?	1		spr	3.75	0.5	F-MS	0.5		N		Y,MANY	N	.1-.25	1	WORM?	2	0			0		1	OX SUBTUBE
-75.88	36.887	261?	2		spr	3	0.5	F-MS	0.5	BIO MOUND?	N		Y, MANY	N	0.1	0			0			0		1	OX
-75.86	36.887	265	1		spr	3.5	2-2.5	F-MS	2	BD	N		N	N	0.5	0			0			0		0	
-75.86	36.887	265	2		spr	5	2	F-MS	2	BD	N		N	N	0.5	0			0			0		0	
-75.85	36.887	267	1		spr	5	1.5-2	F-MS	2	BD	N		N	N	1	0			0			0		1	
-75.84	36.887	269	1		spr	3.5	2.5	F-MS	1	BD	N		N	N	0.5	0			0			0		0	
-75.84	36.887	269	2		spr	3	2	F-MS	1	BD	,UNID		N	N	0.5	0			0			0		0	
-75.86	36.883	276	1		spr	4	1-2	F-MS	2	BD	N		Y	N	0.25	0			0			0		0	
-75.86	36.883	276	2		spr	3.5	1-2	F-MS	0.5	BD	N		N	N	0.25	0			0			0		0	
-75.85	36.883	278	1		spr	3.5	2	F-MS	1.5	BD	N		N	N	0.5	0			0			0		0	
-75.85	36.883	278	2		spr	3.5	2	F-MS	0.5		N		N	N	0.5	0			0			0		0	
-75.84	36.883	280	1		spr	3	2	F-MS	2	BD	N		N	N	1	0			0			0		0	
-75.84	36.883	280	2		spr	3.5	2	F-MS	1		N		N	N	1	0			0			0		0	
-75.88	36.878	281?	1		spr	5	.5-.75	F-MS	0.75	SLOPE	N		Y,MANY	Y?	0.25	1	WORM	1.5	0			0		2	OX,ACT
-75.88	36.878	281?	2		spr	6	1.5	F-MS	0.5	BIO MOUND	Y?		Y,MANY	N?	0.1	0			0			0		2	OX
-75.85	36.878	287	1		spr	4.5	1.5	F-MS	0.5		N		N	N	0.1	0			0			0		0	
-75.85	36.878	287	2		spr	5	1.5	F-MS	0.5-1		N?		Y	N	0.25	0			0			0		1	
-75.84	36.878	289	2		spr	3	1-1.5	F-MS	0.5		N		N	N	0.1	0			0			0		1	
-75.84	36.878	289	3		spr	3.5	1-1.5	F-MS	0.5		HC		1	N	0.1	0			0			0		0	

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,											Surface struct.												
								Sed.	Sed.	Relief			--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna		+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)														
-75.84	36.874	**298**	1		spr	3	1.5	F-MS	0.5		N		N	N	0.1	0			0			0		0	
-75.84	36.874	**298**	2		spr	3	1.5-2	F-MS	0.5		N		Y	N	0.1	0			0			0		0	
-75.84	36.874	**300**	1		spr	4	1.5-2	F-MS	2	BD	N		Y	N	0.1	0			0			0		0	
-75.84	36.874	**300**	2		spr	3.5	1.5	F-MS	1.5	BD	?		Y	N	0.1	0			0			0		1	
-75.9	36.761	**301**	1		spr	5	ABNORMAL	SI-VFS	0.75	BIO?	N		Y,MANY	Y	0.1	0			0			0		0	
-75.9	36.761	**301**	2		spr	2.5	NA	SI-VFS	3	BIO PIT?	N?		Y,MANY	Y	0.1	0			0			0		1	OX
-75.9	36.761	**303**	1		spr	3.5	1.5	VFS-FS	1	BEDF/RIP	N?		Y,FEW	Y	0.1	1?			0			0		0	
-75.9	36.761	**303**	2		spr	3	1	VFS-FS	0.75	MND,TUBE	N		Y,SOME	Y	0.1	0			0			0		1	OX SUBTUBE
-75.89	36.761	**305**	1		spr	4	ALL	MS*	2	BEDF	N		N	N	0.25	0			0			0		0	
-75.89	36.761	**305**	2		spr	9	8.5	MS-CS	8	BEDF*	N		N	N	1	0			0			0		0	
-75.88	36.761	**307**	1		spr	6	ALL	MS-CS	1	BEDF	N		N	N	0.5	0			0			0		0	
-75.88	36.761	**307**	2		spr	8	ALL	MS-CS	3	BEDF	N		N	N	0.1	0			0			0		0	
-75.9	36.758	**312**	1		spr	2.5	0.75	VFS-FS	1.5	SLOPE,TUBE	N?		Y,FEW	Y	0.05	0			0			0		0	
-75.9	36.758	**312**	2		spr	2.5	0.5	FS	2.5	BEDF,TUBES	N		Y,MANY	N	0.05	2*	WORMS	TUBE T	0			0		0	
-75.89	36.758	**314**	1		spr	NA	NA	SI	NA	NA	NA		NA	NA	0.1	3-4	WORM	NA	1	AN		0		2	OX,ACT
-75.89	36.758	**314**	2		spr	10?	IND	SI	NA	TUBES	N		Y,>50	Y	0.01	10	WORMS IN	1-3	0			0		19	OX SUBTUBE
-75.88	36.758	**316**	1		spr	6	ALL	MS-CS	1.75	BEDF	N		N	N	0.5	0			0			0		0	
-75.88	36.758	**316**	2		spr	7	ALL	MS-CS	3	BEDF,CLAST	N		N	N	1	0			0			0		0	
-75.9	36.753	**321**	1		spr	1	NA	FS?	0.75	BIO,TUBES	N		Y,SOME	N	IND	IND			IND			0		0	
-75.9	36.753	**321**	2		spr	2.25	1	FS	0.5	BIO,TUBES	N		Y,MANY	N?	0.05	11	WORM	1.5	0			0		0	
-75.89	36.753	**323**	1		spr	3.5	1	FS	0.5	BIO,TUBE	N		Y,4	Y	0.05	1	WORM/TUB	1.5	0			0		2	OX

Table 3. Spring 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring,									Surface struct.												
							Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
				Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep	96	(cm)	(cm)		(cm)		(+/-)													
-75.89	36.753	**323**	2	spr	4.5	1.5	FS	1	BEDF, TUBE	N	Y, FEW	Y	0.05	0			0			0		2	OX
-75.89	36.753	**325**	1	spr	4.5	4.4	MS-CS	1.75	BEDF	N	N	N	0.25	0			0			0		0	
-75.89	36.753	**325**	2	spr	7.5	ALL	MS-VCS	3.5	BEDF	N	N	N	0.25	0			0			0		0	
-75.9	36.75	**332**	1	spr	3.5	1	FS	0.75	BIO, TUBES	N	Y, 7	Y	0.05	0			0			0		1	OX
-75.9	36.75	**332**	2	spr	2.5	0.3	FS	1	BIO, TUBES	N?	Y, 8-10	Y	0.05	2	WORMS/TU	0.5, 2	0			0		4	1ACT, 3OX
-75.89	36.75	**334**	1	spr	3.5	ALL	MS-GRV	1	BEDF, SHELL	Y, HC	N	N	0.25	0			0			0		0	
-75.89	36.75	**334**	2	spr	3.5	ALL	MS-GRV	0.75	BEDFSLOPE	N	N	N	0.25	0			0			0		0	
-75.9	36.746	**341**	1	spr	2.5	0.3	SI-VFS	0.5	BIO, TUBES	, GAST	Y, 6	Y	0.05	1-2	WORMS/TU	0.5	0			0		IND	
-75.9	36.746	**341**	2	spr	3.5	0.5?	SI-VFS	1.25	BIO, TUBES	N	Y, 10	Y	0.05	2	WORMS	2	0			0		5	3ACT, 2OX
-75.89	36.746	**343**	1	spr	7	1.25	SI-VFS	1.5	BIO, TUBE	N	Y, 10-15	IND	0.1	1	WORM	3	0			0		5	OX, ACT
-75.89	36.746	**343**	2	spr	8	1.25	SI-VFS	0.75	SLOPE, TUBE	N	Y, 10-15	Y	0.1	0			0			0		8	OX
-75.89	36.742	**352**	1	spr	5.5	1	VFS-FS	1	BEDF?, TUBES	N	Y, 10-15	Y?	0.05	0			0			0		3	OX
-75.89	36.742	**352**	2	spr	3.5	0.5	VFS-FS	1	MD, TUBES	, UNID?	Y, 10-15	Y	0.01	0			0			0		3	OX
-75.9	36.738	**361**	1	spr	3.75	1	VFS-FS	0.75	BEDF, TUBES	N?	Y, 3	IND	0.01	1	WORM	2.5	0			0		1	ACT
-75.89	36.733	**372**	1	spr	3.75	0.25	VFS-FS	0.5	MD, TUBES	N	Y, 10-20	Y?	0.1	1	WORM	2	0			0		3	OX, SUBTUBE
-75.89	36.733	**372**	2	spr	6.5	1.5	SI-FS	1	MD, TUBES	N	Y, >15	IND	0.01	1	WORM	3	0			0		2	OX, SUBTUBE
-75.89	36.73	**381**	2	spr	4	0.5	VFS-FS	0.5	MD, TUBES	N	Y, 6	IND	0.01	0			0			0		3	OX
-75.89	36.73	**381**	1	spr	4	0.75	VFS-FS	1	MD, TUBES	N	Y, 3	Y	0.1	0			0			0		1	OX

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.939	36.882	1			fall	5.5	2		1.75		-	0	Pos.	None	0			0			0			
-75.932	36.882	3			fall	7.25	1.75		3.25		-	0	Pos.	2	2	Worm	4.75	0			0			
-75.906	36.882	9			fall	19			1		+	0	None	Trace	2	Worm	16.5	0			0			
-75.934	36.8783	12			fall	7	2		0.5		-	0	Pos.	None	0			0			0			
-75.926	36.8783	14			fall	6.75	6.75		2		+	0	None	Trace	0			0			0			
-75.918	36.8783	16	1b		fall	22	2.25		2		-	1	None	None	2	Worm	10	0			0			
-75.909	36.8783	18	1b		fall	11			0.5		-	0	None	Trace	0			0			0			
-75.9	36.8783	20			fall	9			3.25		+	0	None	Trace	0			0			0			
-75.937	36.8742	21			fall	4.75	1.25		1		-	8	Pos.	1	0			0			0			
-75.928	36.8742	23			fall	9.5	4.5		1.25		-	2	None	None	0			0			0			
-75.92	36.8742	25			fall	17.25	1.75		1		+	8	None	None	1	Worm	13	0			0			
-75.912	36.8742	27			fall	7.5			2.5		-	0	None	Trace	0			0			0			
-75.903	36.8742	29			fall	8			3		-	0	None	Trace	0			0			0			
-75.932	36.87	32			fall	8	3.5		2		+	8	None	None	0			0			0			
-75.923	36.87	34			fall	7.5	7.5		1		-	0	None	Trace	0			0			0			
-75.915	36.87	36			fall	6			2		-	0	None	None	0			0			0			
-75.908	36.87	38			fall	14	1.25		1.25		-	0	Pos.	4	0			0			0			
-75.898	36.87	40			fall	12.25			2		-	0	None	Trace	0			0			0			
-75.934	36.8667	41			fall	4.5	2		3		-	1	Pos.	1	0			0			0			
-75.926	36.8667	43			fall	16.25			1		-	6	None	None	1	Worm	14	0			0			
-75.918	36.8667	45			fall	11			2.5		-	0	None	None	0			0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.91	36.8667	47			fall	12.75	4		1		-	0	None	Trace	0			0			0			
-75.902	36.8667	49			fall	8			4.75		-	0	None	None	0			0			0			
-75.928	36.8622	52			fall	19.25	2.75		0.5		-	0	None	None	4	Worm	10 &18	0			0			
-75.921	36.8622	54			fall	11			1.25		-	0	None	None	0			0			0			
-75.913	36.8622	56			fall	11.5			9		-	0	None	None	0			0			0			
-75.903	36.8622	58			fall	18			1.75		-	8	None	Trace	4	Worm	10.5	0			0			
-75.929	36.8622	60			fall	4.25	4.25		1.5		-	0	None	Trace	0			0			0			
-75.932	36.8583	61			fall	4.5	2		2		-	4	Pos.	Trace	0			0			0			
-75.924	36.8583	63			fall	17.25			2		-	3	None	None	6	Worm	14	0			0			
-75.916	36.8583	65	1b		fall	6.25			3		-	0	None	None	0			0			0			
-75.908	36.8583	67			fall	12			5		-	0	None	Trace	0			0			0			
-75.899	36.8583	69			fall	6.5	5		1.5		-	0	None	Trace	0			0			0			
-75.926	36.8542	72			fall	10			1		-	2	None	None	1	Worm	5	0			0			
-75.918	36.8542	74			fall	5.5	5.5		2		-	0	None	None	0			0			0			
-75.91	36.8542	76			fall	7			2.25		-	0	None	None	0			0			0			
-75.902	36.8542	78			fall	10	4.25		0.25		-	0	Pos.	1	2	Worm	8	0			0			
-75.893	36.8542	80			fall	6.25	6.25		1.25		-	0	None	None	0			0			0			
-75.93	36.8508	81	1b		fall	6			1		-	0	None	None	0			0			0			
-75.922	36.8508	83			fall	16	1.75		0.5		-	7	Pos.	None	1	Worm	9.5	0			0			
-75.913	36.8508	85			fall	8			4		+	0	None	Trace	0			0			0			
-75.905	36.8508	87			fall	4.5	1.75		1.25		-	0	None	Trace	0			0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.896	36.8508	89			fall	6.25	6.25		2		-	0	None	Trace	0			0			0			
-75.923	36.8467	92			fall	6.5	6.5		2		-	0	None	Trace	0			0			0			
-75.917	36.8467	94			fall	6			4		-	0	None	Trace	0			0			0			
-75.908	36.8467	96			fall	13	2.5		0.75		-	8	Pos.	Trace	0			0			0			
-75.899	36.8467	98			fall	9.5	3.75		1		-	0	Pos.	Trace	0			0			0			
-75.891	36.8467	100			fall	5.75	2		1.5		-	1	None	10	0			0			0			
-75.927	36.8433	101			fall	4.5	2.5		0.75		-	0	Pos.	None	0			0			0			
-75.919	36.8433	103			fall	14			1.25		+	0	Pos.	None	0			0			0			
-75.911	36.8433	105			fall	5			1.25		-	0	None	None	0			0			0			
-75.903	36.8433	107			fall	4	2		2		-	0	None	None	0			0			0			
-75.894	36.8433	109			fall	6.25	2		1		-	0	None	7	0			0			0			
-75.922	36.8392	112			fall	7			3.5		-	0	None	Trace	0			0			0			
-75.914	36.8392	114			fall	7.25	7.25		1		-	0	None	Trace	0			0			0			
-75.906	36.8392	116			fall	4.5			0.75		-	0	None	None	0			0			0			
-75.897	36.8392	118			fall	4.75	1.75		0.5		-	0	None	Trace	0			0			0			
-75.888	36.8392	120			fall	4.75	2		1		-	0	None	11	0			0			0			
-75.924	36.8358	121			fall	7.5			2		-	0	None	Trace	0			0			0			
-75.916	36.8358	123			fall	8	8		3		-	0	None	Trace	0			0			0			
-75.908	36.8358	125			fall	4			2		-	0	Pos.	None	0			0			0			
-75.9	36.8358	127			fall	10.75			1.75		-	0	None	Trace	0			0			0			
-75.892	36.8358	129			fall	8.25	2.75		0.75		-	1	None	None	0			0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.92	36.8317	132			fall	4.75	2		2.75		-	8	None	Trace	0			0			0			
-75.912	36.8317	134			fall	4.5			3		-	0	None	Trace	0			0			0			
-75.903	36.8317	136			fall	6			2		-	0	None	Trace	0			0			0			
-75.897	36.8317	138			fall	6			2.25		-	0	None	Trace	0			0			0			
-75.886	36.8317	140			fall	6.5	6		2.25		-	0	None	Trace	0			0			0			
-75.923	36.828	141			fall	6.25	6.25		2.25		-	0	None	Trace	0			0			0			
-75.914	36.828	143			fall	6	2.5		1.75		-	1	None	Trace	0			0			0			
-75.907	36.828	145			fall	6.5			2		-	0	None	None	0			0			0			
-75.898	36.828	147			fall	5			3		-	0	None	2	0			0			0			
-75.889	36.828	149			fall	15.5			0.75		-	0	None	None	1	Worm	4	0			0			
-75.916	36.8237	152			fall	6.5	6.5		2.25		-	0	None	None	0			0			0			
-75.908	36.8237	154			fall	5	2.5		0.75		-	0	Pos.	None	0			0			0			
-75.9	36.8237	156			fall	4.75			0.25		-	0	None	Trace	0			0			0			
-75.893	36.8237	158	1b		fall	5			1.5		-	0	None	7	0			0			0			
-75.883	36.8237	160			fall	5.5			1.5		-	0	None	2	0			0			0			
-75.92	36.8197	161			fall	5.25	3.25		2		-	0	None	1	0			0			0			
-75.913	36.8197	163			fall	6.25	3		2.25		-	1	None	Trace	0			0			0			
-75.904	36.8197	165			fall	4.75	2		1.25		+	0	None	Trace	0			0			0			
-75.896	36.8197	167			fall	5			2.25		-	0	None	Trace	0			0			0			
-75.887	36.8197	169			fall	17.75			1.75		-	0	None	None	0			0			0			
-75.914	36.8158	172			fall	5	2.5		0.75		-	0	Pos.	2	1	Worm	0.25	0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	ellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.907	36.8158	174			fall	5.25	2.5		1.25		-	0	None	Trace	0			0			0			
-75.898	36.8158	176			fall	6	3.25		0.75		-	0	None	None	0			0			0			
-75.889	36.8158	178			fall	4.25			2		-	0	None	None	0			0			0			
-75.882	36.8158	180			fall	2.75			1.25		-	0	None	Trace	0			0			0			
-75.917	36.8117	181			fall	5.5	3.25		1.75		-	0	None	1	0			0			0			
-75.908	36.8117	183			fall	5	2		1		-	0	Pos.	1	0			0			0			
-75.901	36.8117	185			fall	4.5	2.25		2.5		-	0	Pos.	Trace	0			0			0			
-75.893	36.8117	187			fall	7.5	1.5		2.75		+	0	Pos.	None	0			0			0			
-75.884	36.8117	189			fall	5.25			2		-	0	Pos.	None	0			0			0			
-75.912	36.808	192			fall	5			0.5		-	0	Pos.	None	3	Worm	2.75	0			0			
-75.903	36.808	194			fall	5.25	2		3		-	0	None	Trace	0			0			0			
-75.895	36.808	196			fall	4.5	2.75		1.75		-	0	Pos.	1	0			0			0			
-75.888	36.808	198			fall	3.5			0.75		-	0	Pos.	3	0			0			0			
-75.878	36.808	200			fall	4			1.25		-	0	None	1	0			0			0			
-75.885	36.9083	201			fall	5			2		+	0	None	Trace	0			0			0			
-75.877	36.9083	203			fall	5.25	1.75		1.75		-	0	None	1	0			0			0			
-75.868	36.9083	205			fall	4.25	1.5		1.5		-	0	None	None	0			0			0			
-75.88	36.9053	212			fall	2.5			1.25		+	0	None	Trace	0			0			0			
-75.871	36.9053	214			fall	6.5	1.5		2		-	0	None	None	0			0			0			
-75.863	36.9053	216			fall	4.5			0.5		-	1	None	None	0			0			0			
-75.854	36.9053	218			fall	3	1.25		1.75		-	0	Pos.	1	0			0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal									Surface struct.												
							Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
				Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep	96	(cm)	(cm)		(cm)		(+/-)													
-75.846	36.9053	220		fall	3.75	1.5		1.75		-	0	None	4	0			0			0			
-75.883	36.902	221		fall	6			1.5		+	0	None	None	0			0			0			
-75.874	36.902	223		fall	5.75			1		-	0	None	None	0			0			0			
-75.866	36.902	225		fall	5.5			0.75		-	0	None	None	0			0			0			
-75.857	36.902	227		fall	4.5	1.25		2		-	0	None	None	0			0			0			
-75.848	36.902	229		fall	3.25	1.5		0.25		-	0	None	Trace	0			0			0			
-75.878	36.8983	232	1b	fall	3			1.75		-	0	None	None	0			0			0			
-75.869	36.8983	234		fall	6			1		-	0	None	None	0			0			0			
-75.86	36.8983	236		fall	5	1.5		1.5		-	0	None	None	0			0			0			
-75.852	36.8983	238		fall	4	1.5		0.25		-	0	None	Trace	0			0			0			
-75.843	36.8983	240		fall	3	1.5		1.25		+	0	None	Trace	0			0			0			
-75.881	36.8942	241		fall	3.25			0.25		+	0	None	2	0			0			0			
-75.872	36.8942	243		fall	6.5			1		-	0	None	None	0			0			0			
-75.863	36.8942	245		fall	3			1.5		-	0	None	Trace	0			0			0			
-75.855	36.8942	247		fall	2.25			0.75		+	0	None	None	0			0			0			
-75.846	36.8942	249		fall	2.75	1		0.5		+	0	None	Trace	1	Worm	0.75	0			0			
-75.875	36.8908	252		fall	5			1.25		-	0	None	None	0			0			0			
-75.867	36.8908	254		fall	3			0.5		+	0	None	2	0			0			0			
-75.858	36.8908	256		fall	3			1.5		-	0	None	Trace	0			0			0			
-75.85	36.8908	258		fall	2.5			1		+	0	None	None	0			0			0			
-75.841	36.8908	260		fall	3.5			1		+	0	None	None	0			0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	ellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.878	36.8867	261			fall	4.5			1.25		-	0	None	None	0			0			0			
-75.869	36.8867	263			fall	6			0.5		-	0	None	None	0			0			0			
-75.861	36.8867	265			fall	3.75			1.25		-	0	None	1	0			0			0			
-75.853	36.8867	267			fall	2.75			1.25		-	0	None	Trace	0			0			0			
-75.844	36.8867	269			fall	3.5			4.5		-	0	None	Trace	0			0			0			
-75.873	36.8825	272			fall	5			1.5		-	0	None	Trace	0			0			0			
-75.864	36.8825	274			fall	5.25	4.5		0.5		-	0	None	None	0			0			0			
-75.855	36.8825	276			fall	6			0.25		-	0	None	Trace	0			0			0			
-75.847	36.8825	278	1b		fall				1.75		+	0	None	None	0			0			0			
-75.838	36.8825	280			fall	3			1.25		+	0	None	None	0			0			0			
-75.875	36.8783	281			fall	5.5			6.15		-	0	None	None	0			0			0			
-75.867	36.8783	283			fall	4.5	3.75		1.5		-	0	None	Trace	0			0			0			
-75.858	36.8783	285			fall	4.75	3.75		1.5		-	1	None	None	0			0			0			
-75.85	36.8783	287			fall	6			1.25		+	0	None	Trace	0			0			0			
-75.841	36.8783	289			fall	7			1.75		-	0	None	Trace	0			0			0			
-75.87	36.8742	292			fall	4.75			1		-	0	None	None	0			0			0			
-75.862	36.8742	294			fall	4.75	3.5		1.75		-	0	None	None	0			0			0			
-75.853	36.8742	296			fall	5	4		1		-	0	None	Trace	0			0			0			
-75.844	36.8742	298			fall	5.25			0.5		-	0	None	Trace	1	Worm	1.25	0			0			
-75.836	36.8742	300			fall	3.25			1.5		-	0	None	None	0			0			0			
-75.896	36.7613	303			fall	5.5			1.5		-	0	None	None	1	Worm	2.5	0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal									Surface struct.												
							Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
				Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep	96	(cm)	(cm)		(cm)		(+/-)													
-75.888	36.7613	305		fall	6.5	6.5		2.75		-	0	None	Trace	0			0			0			
-75.88	36.7613	307		fall	7			3		-	0	None	Trace	0			0			0			
-75.871	36.7613	309		fall	8.5	8.5		0.25		-	0	None	Trace	0			0			0			
-75.898	36.758	312		fall	5			1.5		-	0	Pos.	None	0			0			0			
-75.891	36.758	314		fall	15	3.5		1.25		-	4	Pos.	None	2	Worm	11.5	0			0			
-75.883	36.758	316		fall	7.5			1.25		-	0	None	Trace	0			0			0			
-75.874	36.758	318		fall	6.5	6.5		3.5		-	0	None	Trace	0			0			0			
-75.866	36.758	320		fall	7	7		1.75		-	0	None	None	0			0			0			
-75.902	36.7533	321		fall	5			1.5		-	0	None	Trace	0			0			0			
-75.895	36.7533	323		fall	6	3		1.75		-	0	None	None	1	Worm	3.5	0			0			
-75.886	36.7533	325		fall	6.5	6.5		1.25		-	0	None	Trace	0			0			0			
-75.878	36.7533	327		fall	6.5	6.5		1.5		-	0	None	None	0			0			0			
-75.87	36.7533	329		fall	7	7		2.25		-	0	None	Trace	0			0			0			
-75.896	36.75	332		fall	6			1		-	0	None	Trace	1	Worm	5	0			0			
-75.888	36.75	334	1b	fall	5.5	5.5		2.5		+	0	None	Trace	0			0			0			
-75.881	36.75	336		fall	7.5	7.5		2.75		-	0	None	Trace	0			0			0			
-75.872	36.75	338		fall	6.75	6.75		1.25		-	0	None	None	0			0			0			
-75.863	36.75	340		fall	10.25	4		1.75		-	0	None	Trace	0			0			0			
-75.899	36.7458	341		fall	5			1		-	0	None	None	0			0			0			
-75.891	36.7458	343		fall	12	3.5		1		-	7	Pos.	None	1	Worm	2.5	0			0			
-75.883	36.7458	345		fall	8	8		4		-	0	None	Trace	0			0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.874	36.7458	347			fall	5.5	5.5		1.5		+	0	None	None	0			0			0			
-75.867	36.7458	349			fall	6	4		2		+	0	None	Trace	0			0			0			
-75.893	36.7417	352			fall	6.5	2		0.5		-	1	Pos.	None	0			0			0			
-75.887	36.7417	354			fall	8	8		5		-	0	None	None	0			0			0			
-75.878	36.7417	356			fall	7	7		7.25		-	0	None	None	0			0			0			
-75.87	36.7417	358			fall	5	2.75		1.25		+	0	None	Trace	0			0			0			
-75.861	36.7417	360			fall	5.5			0.75		-	0	None	1	0			0			0			
-75.897	36.738	361			fall	6.25	14		1		-	0	None	None	0			0			0			
-75.889	36.738	363			fall	6	6		2		-	0	None	None	0			0			0			
-75.881	36.738	365			fall	3.75	3		0.75		+	0	None	Trace	0			0			0			
-75.873	36.738	367			fall	4.5	3		1.5		+	0	None	2	1	Worm	3	0			0			
-75.865	36.738	369			fall	9.75			0.5		-	1	None	Trace	0			0			0			
-75.892	36.7333	372			fall	10.5	2.75		0.75		-	0	None	None	0			0			0			
-75.883	36.7333	374	1b		fall	6	6		1.5		-	0	None	Trace	0			0			0			
-75.876	36.7333	376			fall	6.5	1		1.75		-	0	None	Trace	0			0			0			
-75.868	36.7333	378			fall	4.5			2		+	0	Pos.	None	0			0			0			
-75.859	36.7333	380			fall	6.5			2.5		-	0	None	Trace	0			0			0			
-75.894	36.73	381			fall	6.5	2		1.5		+	0	None	Trace	0			0			0			
-75.887	36.73	383			fall	6.75	6.75		0.75		+	0	None	Trace	0			0			0			
-75.879	36.73	385			fall	6.25	6.25		1.5		+	0	None	Trace	0			0			0			
-75.871	36.73	387	1b		fall	4.25			0.75		+	0	None	Trace	0			0			0			

Table 4. Fall 1996 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Fal										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifau	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		96	(cm)	(cm)		(cm)		(+/-)													
-75.863	36.73	389			fall	5.25			1		-	0	None	Trace	0			0			0			
-75.893	36.7258	392			fall	5.5	2.5		2.25		+	0	Pos.	None	0			0			0			
-75.885	36.7258	394	1b		fall	8.5	7.5		2.25		+	0	None	Trace	0			0			0			
-75.877	36.7258	396			fall	4.75			1.75		-	0	None	Trace	0			0			0			
-75.865	36.7258	398			fall	14			0.75		-	6	None	None	1	Worm	8	0			0			
-75.857	36.7258	400			fall	5.5			2		-	0	None	Trace	0			0			0			

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.9511	36.9166	**97VB001**	1	b	spr	8.0	2.1	SI	1	PIT,SHELL	NONE	NONE	NONE	NONE	0			0			0		0	
-75.9501	36.9151	**97VB001**	2	b	spr	21.3	1.5	SI-CL	1.3	PIT,MOUND	NONE	2	NONE	15	0			0			0		3	AN
-75.9248	36.9196	**97VB002**	1	b	spr	12	3	SI	0.5	SHELL	NONE	5	NONE	10	0			0			0		5	AN
-75.9248	36.9196	**97VB002**	2	b	spr	14.2	6	SI-CL	1.2	PIT,MOUND	NONE	1	NONE	10	1	WORM	10.3	0			0		0	
-75.8996	36.9227	**97VB003**	1	b	spr	4.3	4.3	FS	1	BEDFORM,SI	NONE	1	NONE	5	0			0			0		0	
-75.8996	36.9283	**97VB003**	2	a	spr			FS	1.8	BEDFORM,SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8742	36.9256	**97VB004**	1	b	spr	3.3	3.3	FS	1.7	BEDFORM,SI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8742	36.9256	**97VB004**	2	b	spr	4.5	2.5	FS	2.1	SHELL	7 SAND D(	NONE	NONE	5	0			0			0		0	
-75.8488	36.9284	**97VB005**	1	b	spr	8.3		FS	1.9	BEDFORM,SI	2 SAND D(	NONE	NONE	TRACE	0			0			0		0	
-75.8488	36.9284	**97VB005**	2	b	spr	7.1	2.2	FS	1.4	BEDFORM	3 SAND D(	NONE	NONE	TRACE	0			0			0		0	
-75.8574	36.9160	**97VB009**	1	b	spr	6.4	0.3	FS	3.4	PIT,SHELL	CRUSTACEA	NONE	NONE	5	0			0			0		0	
-75.8574	36.9160	**97VB009**	2	b	spr	4.7	0.7	FS	1.7	BEDFORM,SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8828	36.9131	**97VB008**	1	b	spr	4.2	3	FS	2.3	SHELL,PIT	NONE	NONE	NONE	5	0			0			0		0	
-75.8828	36.9131	**97VB008**	2	b	spr	6.8	2	FS	2	SHELL,PIT	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9081	36.9101	**97VB007**	1	b	spr																			
-75.9081	36.9101	**97VB007**	2	a	spr			CL		ROCKY	HERMIT CI	NONE	NONE	50	0			0			0		0	
-75.9332	36.9071	**97VB006**	1	b	spr	>24		SI	IND	IND	IND	IND	IND	5	3	WORMS	IND	0			0		1	AN
-75.9332	36.9071	**97VB006**	2	b	spr	18.6	2.8	SI	1.3	MOUND	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9423	36.8946	**97VB011**	1	b	spr	19.4	2.9	FS-SI	1.5	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.9423	36.8946	**97VB011**	2	b	spr	20.4	4.2	SI	1	SHELL	NONE	NONE	NONE	NONE	0			0			0		0	
-75.9168	36.8976	**97VB012**	1	b	spr	8.3	8.3	CS	2.5	BEDFORM	NONE	NONE	NONE	5	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.9168	36.8976	**97VB012**	2	b	spr	11.5	11.5	CS	1.2	BEDFORM	NONE	NONE	NONE	5	0			0			0		0	
-75.8913	36.9007	**97VB013**	1	b	spr	4.8	3	FS	0.3	EVEN	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8913	36.9007	**97VB013**	2	b	spr	5.2	1.7	FS	0.7	SHELL	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8656	36.9035	**97VB014**	1	b	spr	5.2	2.6	FS	2	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8661	36.9044	**97VB014**	2	b	spr	4.4	3.2	FS	1.3	BEDFORM,SI	NONE	NONE	NONE	5	0			0			0		0	
-75.8405	36.9064	**97VB015**	1	b	spr	4.8	3	FS	1.4	BEDFORM,SI	SAND DOLI	NONE	NONE	TRACE	0			0			0		0	
-75.8405	36.9064	**97VB015**	2	b	spr	5.2	1.7	FS	1.5	BEDFORM,SI	SAND DOLI	NONE	NONE	TRACE	0			0			0		0	
-75.8492	36.9111	**97VB019**	1	b	spr	5.1	2.7	FS	1.6	BEDFORM,SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8492	36.9111	**97VB019**	2	b	spr	5.1	4	FS	1	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8743	36.8910	**97VB018**	1	b	spr	5.6	4.4	FS	1.7	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8743	36.8910	**97VB018**	2	b	spr	4.3	4.3	FS	1.9	BEDFORM,SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8998	36.8881	**97VB017**	1	b	spr	8.3	3.2	CS	0.7	SHELL	NONE	NONE	NONE	5	0			0			0		0	
-75.8998	36.8881	**97VB017**	2	b	spr	8.3	3.9	CS	0.3	BEDFORM,SI	NONE	NONE	NONE	5	0			0			0		0	
-75.9253	36.8852	**97VB016**	1	b	spr	23.5	4.2	FS-SI	1.8	PIT,MOUND	NONE	NONE	NONE	TRACE	1	WORM	8.2	1	AN	17.5	0		2	OX
-75.9253	36.8852	**97VB016**	2	b	spr	10.2	7	CS	0.3	BEDFORM,SI	NONE	1	NONE	5	0			0			0		0	
-75.9336	36.8726	**97VB021**	1	b	spr	10.5	6.2	FS-SI	1.5	BEDFORM	NONE	NONE	NONE	NONE	1	CRUSTACI	6.3	0			0		1	AN
-75.9336	36.8726	**97VB021**	2	b	spr	12	6	FS	1.5	BEDFORM	NONE	2	NONE	TRACE	0			0			0		2	OX
-75.9083	36.8757	**97VB022**	1	b	spr	4.8	4.8	MS	1.4	MOUND	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9083	36.8757	**97VB022**	2	b	spr	9.1	6	MS	0.7	BEDFORM,SI	NONE	NONE	NONE	TRACE	1	WORM	2.3	0			0		0	
-75.8827	36.8789	**97VB023**	1	b	spr	6.5	1.8	CS	0.7	ROCK,SHELI	NONE	NONE	NONE	5	0			0			0		0	
-75.8576	36.8814	**97VB024**	1	b	spr	1.8	1.8	FS	1.1	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.8576	36.8814	**97VB024**	2	b	spr	5.5	3.7	FS	1.5	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8324	36.8845	**97VB025**	1	b	spr	4.9	4.9	FS	0.4	SHELL, BEDI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8324	36.8845	**97VB025**	2	b	spr	6.1		FS	3	BEDFORM, SI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8411	36.8717	**97VB029**	1	b	spr	5.3	3.7	FS	1.5	BEDFORM, SI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8411	36.8717	**97VB029**	2	b	spr	5.3	5.3	FS	1.9	BEDFORM, SI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8659	36.8687	**97VB028**	1	b	spr	4.9	2.2	SI	0.7	SHELL, MOUI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8659	36.8687	**97VB028**	2	b	spr	5.8	3	SI	0.6	SHELL	NONE	2	NONE	5	0			0			0		0	
-75.8910	36.8659	**97VB027**	1	b	spr	10	10	MS	0.9	SHELL	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8919	36.8661	**97VB027**	2	b	spr	6.4	6.4	MS	0.6	EVEN	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9171	36.8628	**97VB026**	1	b	spr	7.8	4.2	MS	0.9	BEDFORM	NONE	NONE	NONE	5	0			0			0		0	
-75.9171	36.8628	**97VB026**	2	b	spr	13.9	6.3	MS-CL	1.1	BEDFORM	NONE	NONE	NONE	5	0			0			0		0	
-75.9257	36.8507	**97VB031**	1	b	spr	7.9	6	MS	2	BEDFORM	NONE	NONE	NONE	10	0			0			0		0	
-75.9257	36.8511	**97VB031**	2	b	spr	8.5	8.5	MS	0.7	EVEN	NONE	1	NONE	TRACE	0			0			0		0	
-75.9004	36.8533	**97VB032**	1	b	spr	5.9	5.5	CS-FS	0.3	EVEN	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9004	36.8533	**97VB032**	2	b	spr	6.7	6.7	MS	0.6	BEDFORM	NONE	3	NONE	TRACE	0			0			0		0	
-75.8752	36.8562	**97VB033**	1	b	spr	17.5	6.8	SI	1	PLANT DETI	NONE	4	NONE	5	0			0			0		0	
-75.8752	36.8562	**97VB033**	2	b	spr	7.5	5.9	FS-SI	1.2	PLANT DETI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8495	36.8574	**97VB034**	1	b	spr	6	5.5	FS	2.3	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8495	36.8574	**97VB034**	2	b	spr	6	4.8	FS	1.2	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8250	36.8621	**97VB035**	1	b	spr	7.7	6.7	MS	0.7	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8250	36.8621	**97VB035**	2	b	spr	6.3	6.3	MS	0.7	BEDFORM, SI	NONE	NONE	NONE	NONE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										**Surface struct.**												
								Sed.	**Sed.**	**Relief**		**--Tubes--**		**Subsurf**	**---Infauna----**			**Voids**						
					Date	**PEN**	**RPD**	**Type**	**Rel.**	**Type**	**Epifauna**	**+/-**	**Pellets**	**Shell**	**#**	**Type**	**Depth**	**#**	**Type**	**Depth**	**Gas**	**Depth**	**Burrow**	**Type**
LON	**LAT**	**cell**	**rep**		**97**	**(cm)**	**(cm)**		**(cm)**		**(+/-)**													
-75.8333	36.8489	**97VB039**	1	b	spr	5.3	5.3	FS	1.3	BEDFORM, SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8333	36.8489	**97VB039**	2	b	spr	7	7	MS	1.4	BEDFORM, SI	NONE	NONE	NONE	10	0			0			0		0	
-75.8587	36.8468	**97VB038**	1	b	spr	6.1		FS	2	BEDFORM, SI	NONE	NONE	NONE	5	0			0			0		0	
-75.8587	36.8468	**97VB038**	2	b	spr	5.7		FS	0.9	BEDFORM, SI	NONE	NONE	NONE	TRACE	0			0			0		1	AN
-75.8837	36.8439	**97VB037**	1	b	spr	5.5	5	FS	1.4	BEDFORM, PI	NONE	1	NONE	TRACE	0			0			0		0	
-75.8837	36.8439	**97VB037**	2	b	spr	6	3.5	FS	0.8	BEDFORM, SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9091	36.8409	**97VB036**	1	b	spr	9.7		MS	1.8	SLOPE	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9088	36.8402	**97VB036**	2	b	spr	6.2	6.2	MS-FS	0.4	SHELL	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9174	36.8287	**97VB041**	1	b	spr	6	0.7	FS	2.1	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9174	36.8287	**97VB041**	2	b	spr	6.3	6.3	FS	1.8	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8926	36.8312	**97VB042**	1	b	spr	7.3	3.8	FS	1.3	BEDFORM, SI	NONE	NONE	NONE	5	0			0			0		0	
-75.8926	36.8312	**97VB042**	2	b	spr	6.4	2	FS-SI	2	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8672	36.8342	**97VB043**	1	b	spr	6.1	4.2	FS	2.4	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8672	36.8342	**97VB043**	2	b	spr	5.9	2.7	FS	2.2	SHELL, BEDI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8425	36.8373	**97VB044**	1	b	spr	8.9	8.9	MS	2.1	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8420	36.8367	**97VB044**	2	b	spr	6.9	6.9	MS-FS	1.3	SHELL, BEDI	HERMIT CI	NONE	NONE	5	0			0			0		0	
-75.8175	36.8400	**97VB045**	1	b	spr	7.5	7.5	MS	0.6	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8176	36.8401	**97VB045**	2	b	spr	6.2	6.2	MS	0.9	SHELL, BEDI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8504	36.8247	**97VB048**	1	b	spr	5.7	5.7	MS	3.7	SHELL, BEDI	SAND DOLI	NONE	NONE	TRACE	0			0			0		0	
-75.8761	36.8219	**97VB047**	1	b	spr	5.4	5.4	FS	1.6	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8761	36.8220	**97VB047**	2	a	spr		5.7	FS	1.9	DISTURBED	NONE	NONE	NONE	NONE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellet:	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.9014	36.8190	**97VB046**	1	b	spr	15.5	15.5	CL	0.7	MOUND	NONE	3	NONE	NONE	0			6	1 OX,5 AN		0		1	AN
-75.9013	36.8191	**97VB046**	2	b	spr	5.7	1.4	CL-SI	1.9	SHELL,BEDI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.9102	36.8065	**97VB051**	1	b	spr	5.8	4	FS	1.4	SHELL,BEDI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.9102	36.8065	**97VB051**	2	b	spr	6.2	4.8	FS	1	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8843	36.8093	**97VB052**	1	b	spr	7.3	6	FS	1.6	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8844	36.8093	**97VB052**	2	b	spr	5.9	5.9	FS	1.9	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8596	36.8123	**97VB053**	1	b	spr	4.8	4.8	FS	1.6	SHELL,BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8596	36.8124	**97VB053**	2	b	spr	5.3	5.3	FS	1.8	MOUND	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8596	36.8153	**97VB054**	1	b	spr	5.3	4	FS	1.1	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8340	36.8154	**97VB054**	2	b	spr	5.8	5.8	FS	0.5	SHELL	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8428	36.8034	**97VB058**	1	b	spr	8	8	SI	2.7	SHELL,ROCI	NONE	NONE	NONE	50	0			0			0		1	AN
-75.8428	36.8035	**97VB058**	2	b	spr	7.2	7.2	MS	1.2	SHELL,MOUI	NONE	2	NONE	25	0			0			0		0	
-75.8681	36.7997	**97VB057**	1	b	spr	6.4	6.4	SI	0.3	SHELL,BEDI	NONE	NONE	NONE	5	0			0			0		0	
-75.8680	36.7997	**97VB057**	2	b	spr	5	5	SI	1.8	SHELL,BEDI	NONE	NONE	NONE	5	0			0			0		0	
-75.8926	36.7970	**97VB056**	1	b	spr	8.5	8.5	FS	2.7	MOUND,BEDI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8926	36.7970	**97VB056**	2	b	spr	6.8	6.8	FS	1.5	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.9018	36.7848	**97VB061**	1	b	spr	5	2	FS	2	SHELL,BEDI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.9018	36.7846	**97VB061**	2	b	spr	7.8	7.8	FS	1.5	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8765	36.7875	**97VB062**	1	b	spr	8	8	FS	3.4	SLOPE	NONE	NONE	NONE	20	0			0			0		0	
-75.8765	36.7876	**97VB062**	2	b	spr	11	4.6	FS	0.9	BEDFORM	NONE	NONE	NONE	20	0			0			0		0	
-75.8514	36.7905	**97VB063**	1	b	spr	4.9	4.9	CS	3.2	SHELL,SLOI	NONE	NONE	NONE	50	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.8514	36.7905	**97VB063**	2	b	spr	5.3	5.3	CS	2.1	SHELL,ROC	NONE	NONE	NONE	50	0			0			0		0	
-75.8262	36.7927	**97VB064**	1	b	spr	6.2	4	SI	1.5	ROCK,SHEL	NONE	1	NONE	5	0			0			0		0	
-75.8347	36.7807	**97VB068**	1	b	spr	4.2	4.2	CS	3.3	MOUND	NONE	11	NONE	TRACE	0			0			0		0	
-75.8345	36.7809	**97VB068**	2	a	spr			CS	1.6	SHELL,SLO	NONE	NONE	NONE	5	0			0			0		0	
-75.8934	36.7628	**97VB071**	1	b	spr	12.5	12.5	FS	1.2	BEDFORM	NONE	10	NONE	NONE	0			0			0		4	1 OX,3 A
-75.8935	36.7624	**97VB071**	2	b	spr	9.9	7	FS	0.8	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8855	36.7748	**97VB066**	1	b	spr	7.8	7.8	FS	1.1	SHELL	NONE	NONE	NONE	5	0			0			0		0	
-75.8855	36.7750	**97VB066**	2	b	spr	2.5	2.5	FS	4.5	MOUND,SHE	NONE	NONE	NONE	5	0			0			0		0	
-75.8686	36.7649	**97VB072**	1	b	spr	5.5	5.5	FS	1.4	SHELL,MOU	NONE	NONE	NONE	5	0			0			0		0	
-75.8686	36.7650	**97VB072**	2	b	spr	6.5	6.5	FS	1.5	SHELL,BED	NONE	NONE	NONE	5	0			0			0		0	
-75.8431	36.7685	**97VB073**	1	b	spr	6.4	6.4	FS	1.3	SHELL	NONE	NONE	NONE	50	0			0			0		0	
-75.8431	36.7687	**97VB073**	2	a	spr		8.8	FS	1.3	SHELL	NONE	NONE	NONE	50	0			0			0		0	
-75.8431	36.7688	**97VB073**	3	b	spr	4	4	FS	4.8	SHELL	NONE	NONE	NONE	25	0			0			0		0	
-75.8431	36.7685	**97VB074**	1	b	spr	8.8	8.8	SI	0.8	ROCK,SHEL	NONE	NONE	NONE	30	0			0			0		0	
-75.8174	36.7709	**97VB074**	2	b	spr	8	8	SI	0.7	ROCK,SHEL	NONE	NONE	NONE	10	0			0			0		0	
-75.9297	36.8778	**96VB013**	1	b	spr	22	10	FS-SI	2.9	MOUND,PIT	NONE	NONE	NONE	NONE	0			1	AN	11.3	0		0	
-75.9304	36.8778	**96VB013**	2	b	spr	23.1	16.2	FS-SI	1.8	MOUND	IND	IND	IND	IND	5	WORMS	12,16	0			0		2	I OX,1 A
-75.9233	36.8739	**96VB024**	1	b	spr	16	4.3	FS-SI	1.4	BEDFORM	NONE	3	NONE	NONE	1	WORM	17	0			0		0	
-75.9232	36.8736	**96VB024**	2	b	spr	7.7	7.7	FS-CL	4	MOUND	NONE	NONE	NONE	NONE	1	WORM	8.7	0			0		0	
-75.9015	36.8667	**96VB049**	1	b	spr	8.7	8.7	FS	1.3	SHELL,BED	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9015	36.8667	**96VB049**	2	b	spr	8	8	FS	0.5	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.9117	36.8584	**96VB066**	1	b	spr	13.5	13.5	FS-SI	1.1	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9118	36.8598	**96VB066**	2	b	spr	13	3.7	FS-SI	1.3	BEDFORM	NONE	6	NONE	TRACE	0			0			0		0	
-75.9150	36.8433	**96VB104**	1	b	spr	11.8	6	FS-SI	1.4	BEDFORM	NONE	7	FEW	NONE	0			0			0		0	
-75.9151	36.8432	**96VB104**	2	b	spr	14.9	7.2	FS-SI	2	MOUND, PIT	NONE	13	NONE	NONE	0			0			0		0	
-75.9071	36.8432	**96VB106**	1	b	spr	8.5	8.5	FS	1.1	SHELL	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9071	36.8431	**96VB106**	2	b	spr	7.8	2.4	FS-SI	1.4	SHELL, DIS	NONE	2	NONE	TRACE	0			0			0		0	
-75.9083	36.8390	**96VB115**	1	b	spr	5.5	5.5	FS	2.6	SHELL, BED	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9083	36.8391	**96VB115**	2	b	spr	9.3	9.3	FS	0.7	BEDFORM	NONE	NONE	FEW	NONE	0			0			0		0	
-75.9000	36.8316	**96VB137**	1	b	spr	7.5	7.5	FS	1.7	ROCK, SHEL	NONE	NONE	NONE	25	0			0			0		0	
-75.9000	36.8316	**96VB137**	2	b	spr	5.5	5.5	FS	3	ROCK, SHEL	NONE	NONE	NONE	25	0			0			0		0	
-75.9140	36.8149	**96VB174**	1	b	spr	5.7	5.7	FS	2.1	SHELL, BED	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9140	36.8155	**96VB174**	2	b	spr	6.5	6.5	FS	1	SHELL, BED	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9009	36.8117	**96VB185**	1	b	spr	6.3	6.3	FS	1.9	SHELL, BED	NONE	NONE	NONE	TRACE	0			0			0		1	OX
-75.9008	36.8117	**96VB185**	2	b	spr	4.8	4.8	FS	3.5	BEDFORM	NONE	NONE	NONE	5	0			0			0		0	
-75.9035	36.8079	**96VB194**	1	b	spr	5.3	5.3	FS	3.3	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.9034	36.8079	**96VB194**	2	b	spr	6.7	6.7	FS	1	SHELL, BED	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8820	36.7579	**96VB316**	1	b	spr	6	6	MS	1.5	PIT, MOUND	NONE	NONE	NONE	5	0			0			0		0	
-75.8819	36.7580	**96VB316**	2	b	spr	11.5	11.5	MS	3.7	SHELL, BED	NONE	2	NONE	TRACE	0			0			0		0	
-75.8957	36.7500	**96VB332**	1	b	spr	8.8	6.8	FS	2.3	MOUND, PIT	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8953	36.7499	**96VB332**	2	b	spr	12.8	4.6	FS	2	BEDFORM	NONE	NONE	NONE	NONE	2	WORM	3.4,1	0			0		1	OX
-75.8742	36.7459	**96VB347**	1	b	spr	9.5	9.5	FS	3.1	SHELL, BED	NONE	NONE	NONE	TRACE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										**Surface struct.**												
								Sed.	**Sed.**	**Relief**		**--Tubes--**		**Subsurf**	**---Infauna----**			**Voids**						
					Date	**PEN**	**RPD**	**Type**	**Rel.**	**Type**	**Epifauna**	**+/-**	**Pellets**	**Shell**	**#**	**Type**	**Depth**	**#**	**Type**	**Depth**	**Gas**	**Depth**	**Burrow**	**Type**
LON	**LAT**	**cell**	**rep**		**97**	**(cm)**	**(cm)**		**(cm)**		**(+/-)**													
-75.8740	36.7460	**96VB347**	2	b	spr	8.2	8.2	FS	1.1	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8899	36.7416	**96VB353**	1	b	spr	10.5	10.5	MS	0.5	ROCK,SHELI	NONE	1	NONE	50	0			0			0		0	
-75.8897	36.7416	**96VB353**	2	b	spr	7.5	7.5	MS	1.2	ROCK,SHELI	NONE	NONE	NONE	50	0			0			0		0	
-75.8806	36.7381	**96VB365**	1	b	spr	7.2	7.2	FS	1.8	SHELL,MOUI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8806	36.7381	**96VB365**	2	b	spr	8	8	FS	0.8	SHELL,BEDI	NONE	NONE	NONE	5	0			0			0		0	
-75.8715	36.7334	**97VB377**	1	b	spr	8.5	8.5	FS	1.3	BEDFORM.DI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8713	36.7335	**96VB377**	2	b	spr	4.7	3.9	FS	0.7	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8684	36.7303	**97VB086**	1	b	spr																			
-75.8683	36.7303	**97VB086**	2	b	spr	7.5	3.5	FS-SI	2.4	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8438	36.7334	**97VB087**	1	b	spr	9.1	9.1	MS	2	SHELL,BEDI	NONE	NONE	NONE	25	0			0			0		0	
-75.8420	36.7335	**97VB087**	2	b	spr	5	5	FS	2.5	BEDFORM,SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8185	36.7375	**97VB088**	1	b	spr	5.9	5.9	MS	1.9	BEDFORM,SI	NONE	NONE	NONE	5	0			0			0		0	
-75.8185	36.7375	**97VB088**	2	b	spr	10.7	10.7	MS	2	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8093	36.7490	**97VB084**	1	b	spr	6	6	CS	4	SHELL,SLOI	NONE	NONE	NONE	25	0			0			0		0	
-75.8098	36.7491	**97VB084**	2	b	spr	8.5	8.5	FS	1.9	SHELL	NONE	NONE	NONE	30	0			0			0		0	
-75.8348	36.7459	**97VB083**	1	b	spr	6.7	6.7	FS	1.2	SHELL,BEDI	NONE	NONE	NONE	15	0			0			0		0	
-75.8348	36.7459	**97VB083**	2	b	spr	4.8	4.8	FS	1.3	BEDFORM,SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8603	36.7431	**97VB082**	1	b	spr	7	1.3	FS-SI	0.6	BEDFORM,SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8636	36.7478	**97VB082**	2	b	spr	6.8	6.8	FS	1.5	BEDFORM,SI	NONE	NONE	FEW	NONE	0			0			0		0	
-75.8768	36.7525	**97VB076**	1	b	spr	10	10	MS	2.5	SHELL,BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8768	36.7525	**97VB076**	2	b	spr	7.1	7.1	FS	1.3	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsur:	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellet:	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.8516	36.7552	**97VB077**	1	b	spr	4.8	4.8	MS	1.7	SLOPE	NONE	NONE	NONE	5	0			0			0		0	
-75.8516	36.7552	**97VB077**	2	b	spr	7.3	7.3	MS	0.8	BEDFORM, SI	NONE	NONE	NONE	5	0			0			0		0	
-75.8263	36.7585	**97VB078**	1	b	spr	5.5	5.5	MS	1.3	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8262	36.7587	**97VB078**	2	b	spr	7	7	MS	0.8	BEDFORM, SI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8018	36.7269	**97VB094**	1	b	spr	8.3	8.3	MS	1.7	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8018	36.7271	**97VB094**	2	b	spr	6.5	6.5	MS	2.1	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8270	36.7239	**97VB093**	1	b	spr	6	4.7	SI	0.7	SHELL, BEDI	NONE	NONE	NONE	5	0			0			0		0	
-75.8270	36.7241	**97VB093**	2	b	spr	8.1	2.3	SI	0.8	SHELL	NONE	NONE	NONE	10	0			0			0		0	
-75.8523	36.7213	**97VB092**	1	b	spr	9	9	FS	2.8	MOUND, SHEI	NONE	NONE	NONE	5	1	CRUSTACI	0.7	0			0		1	AN
-75.8523	36.7214	**97VB092**	2	b	spr	5.8	5.8	FS	4.5	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8777	36.7181	**97VB091**	1	b	spr	7	7	FS	2	SHELL, BEDI	NONE	NONE	NONE	10	0			0			0		0	
-75.8776	36.7182	**97VB091**	2	b	spr	5.3	5.3	FS	3.5	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8586	36.7085	**97VB096**	1	b	spr	3.3	3.3	SI	2.3	SHELL, SLOI	NONE	NONE	NONE	TRACE	0			0			0		1	AN
-75.8610	36.7086	**97VB096**	2	b	spr	8.1	8.1	FS	2.3	SLOPE	NONE	4	NONE	5	0			1	OX	7.5	0		0	
-75.8356	36.7114	**97VB097**	1	b	spr	3.3	3.3	FS	3	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8356	36.7116	**97VB097**	2	b	spr	5.2	4.7	FS	2.3	SHELL, BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8104	36.7144	**97VB098**	1	b	spr	11.8	11.8	MS	5	BEDFORM	NONE	6	NONE	TRACE	0			0			0		0	
-75.8114	36.7149	**97VB098**	2	b	spr	5.8	5.8	MS	1.3	BEDFORM	NONE	1	NONE	TRACE	0			0			0		0	
-75.7936	36.7048	**97VB104**	1	b	spr	10.3	10.3	MS	2	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.7936	36.7050	**97VB104**	2	b	spr	5.5	5.5	MS	1.8	SHELL, BEDI	NONE	2	NONE	TRACE	0			0			0		0	
-75.8189	36.7020	**97VB103**	1	b	spr	8.5	8.5	FS	2.2	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.8189	36.7021	**97VB103**	2	b	spr	5.4	5.4	FS	2	SHELL,BEDI	NONE	1	NONE	TRACE	0			0			0		0	
-75.8440	36.6989	**97VB102**	1	b	spr	4	4	MS	2.4	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8440	36.6992	**97VB102**	2	b	spr	5	5	MS	0.5	SHELL,BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8694	36.6958	**97VB101**	1	b	spr	9.5	9.5	FS	2.7	SHELL,BEDI	NONE	1	NONE	5	0			0			0		0	
-75.8694	36.6960	**97VB101**	2	b	spr	9.3	9.3	FS	3.7	SHELL,BEDI	NONE	NONE	NONE	5	0			0			0		0	
-75.8527	36.6861	**97VB106**	1	b	spr	6.7	6.7	SI	1.2	SHELL	NONE	1	NONE	10	0			0			0		1	AN
-75.8527	36.6862	**97VB106**	2	b	spr	6.1	3	SI	1.5	SHELL	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8274	36.6889	**97VB107**	1	b	spr	10	3.2	FS-SI	1.5	SHELL,MOUI	HERMIT CI	1	NONE	NONE	1	WORM	9	0			0		4	OX
-75.8273	36.6894	**97VB107**	2	b	spr	14.5	6.4	FS-SI	1.1	MOUND,SHEI	NONE	5	NONE	NONE	1	WORM	5.6	0			0		0	
-75.8023	36.6917	**97VB108**	1	b	spr	5.2	5.2	FS	0.9	BEDFORM	NONE	1	NONE	TRACE	0			0			0		0	
-75.8022	36.6930	**97VB108**	2	b	spr	6.3	6.3	FS	2.3	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8847	36.9081	**96VB201**	1	b	spr	7.1	7.1	FS	1.7	BEDFORM	NONE	4	NONE	TRACE	0			0			0		0	
-75.8846	36.9082	**96VB201**	2	b	spr	7.1	7.1	FS	1.3	BEDFORM	NONE	2	NONE	TRACE	0			0			0		0	
-75.8677	36.9084	**96VB205**	1	b	spr	6.3	6.3	FS	1.4	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8678	36.9086	**96VB205**	2	b	spr	5.3	5.3	FS	0.7	NONE	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8506	36.9082	**96VB209**	1	b	spr	5.8	5.8	FS	1.4	SHELL,BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8505	36.9082	**96VB209**	2	b	spr	5.4	5.4	FS	0.3	SHELL,BEDI	HERMIT CI	NONE	NONE	TRACE	0			0			0		0	
-75.8503	36.9084	**96VB209**	3	b	spr	5	5	FS	2.8	SHELL,BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8509	36.9080	**96VB209**	4	b	spr	4.7	4.7	FS	2.6	BEDFORM	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8692	36.8981	**96VB234**	1	b	spr	5	5	FS	1.4	SHELL,BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8688	36.8983	**96VB234**	2	b	spr	6.8	6.8	FS	2.3	SHELL,BEDI	NONE	NONE	NONE	NONE	0			0			0		0	

Table 5. Spring 1997 SPI analysis.

		Virginia Beach Sandmining Project SPI visual analysis: Spring, 19										Surface struct.												
								Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
					Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
LON	LAT	cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
-75.8583	36.8939	**96VB246**	1	b	spr	5.6	5.6	FS	1.1	SHELL,BEDI	NONE	NONE	NONE	TRACE	0			0			0		0	
-75.8582	36.8939	**96VB246**	2	b	spr	5.3	5.3	FS	1.5	BEDFORM	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8624	36.8907	**96VB255**	1	b	spr	4.7	4.7	FS	1.1	BEDFORM,SI	NONE	NONE	NONE	NONE	0			0			0		0	
-75.8624	36.8907	**96VB255**	2	b	spr	6.2	6.2	FS	1.5	SHELL,BEDI	NONE	NONE	NONE	NONE	0			0			0		0	

Table 6. Fall 1997 SPI analysis (Sandbridge area).

Virginia Beach Sandmining Project SPI visual analysis										Surface struct.												
						Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
			Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
SO-001	1	B	FAL	5	ALL	FS	1	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-001	2	B	FAL	6	1.4	FS	1.2	BEDFORM	0	0	3	TRACE	0			0			0		0	
SO-002	1	B	FAL	7	ALL	MS	1	BEDFORM	0	0	1	TRACE	0			0			0		0	
SO-002	2	B	FAL	6	ALL	MS	0.8	SLOPE	0	0	0	1, TRAC	0			0			0		0	
SO-003	1	B	FAL	6	4.2	FS	1.1	BEDFORM	0	0	2	TRACE	0			0			0		0	
SO-003	2	B	FAL	6.4	2.7	FS	0.4	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-004	1	B	FAL	6	ALL	MS	0.5	BEDFORM	1	0	0	TRACE	0			0			0		0	
SO-004	2	B	FAL	6	1.7	FS	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-005	1	B	FAL	7	ALL	FS	0.8	BEDFORM	1, SANDI	0	0	3	0			0			0		0	
SO-005	2	B	FAL	5	ALL	FS	2.1	SLOPE	1, SANDD	0	0	TRACE	0			0			0		0	
SO-006	1	B	FAL	7.8	ALL	MS	2	BEDFORM	0	0	1	TRACE	0			0			0		0	
SO-006	2	B	FAL	4	ALL	MS	0.4	EVEN	0	0	0	1, TRAC	0			0			0		0	
SO-007	1	B	FAL	4.5	1.6	FS	0.9	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-007	2	B	FAL	4.5	0.8	FS-SI	1.5	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-008	1	B	FAL	6	ALL	MS	1.8	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-008	2	B	FAL	7	ALL	MS	3.2	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-009	1	B	FAL	8	ALL	MS	2.8	SLOPE	0	0	0	1, TRA	0			0			0		0	
SO-009	2	B	FAL	5	ALL	MS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-010	1	B	FAL	5	ALL	MS	4	MOUND	0	0	0	TRACE	0			0			0		0	
SO-010	2	B	FAL	6	ALL	MS	4.7	SLOPE	0	0	0	0	0			0			0		0	
SO-011	1	B	FAL	4	0.4	FS-SI	0.2	EVEN	0	0	0	TRACE	0			0			0		0	

Table 6. Fall 1997 SPI analysis (Sandbridge area).

Virginia Beach Sandmining Project SPI visual analysis										Surface struct.												
						Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
			Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellet	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
SO-011	2	B	FAL	4.7	0.3	FS-SI	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-012	1	B	FAL	4.3	0.2	FS-SI	0.2	EVEN	0	0	0	TRACE	0			0			0		1	AN
SO-012	2	B	FAL	5.6	0.4	FS-SI	0.3	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-013	1	B	FAL	7.5	1.5	FS	3	BEDFORM	0	0	11	0	0			0			0		0	
SO-013	2	B	FAL	1.8	ALL	FS	0.7	BEDFORM	0	0	15	0	0			0			0		0	
SO-014	1	B	FAL	4	1.2	FS	1.2	BEDFORM	0	0	3	0	0			0			0		0	
SO-014	2	B	FAL	4.5	1.4	FS-SI	0.8	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-015	1	B	FAL	5.2	1.2	FS	1.2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-015	2	B	FAL	6	ALL	MS	2.1	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-016	1	B	FAL	8	0.6	FS-SI	0.2	EVEN	0	1	16	TRACE	0			0			0		0	
SO-016	2	B	FAL	11	0.4	FS-SI	0.3	EVEN	0	0	3	1, TRA	0			0			0		1	OX
SO-017	1	B	FAL	5	0.4	FS-SI	1	BEDFORM	0	4	0	TRACE	0			0			0		2	AN
SO-017	2	B	FAL	4	0.7	FS-SI	0.6	BEDFORM	0	0	2	2, TRA	0			0			0		2	OX
SO-018	1	B	FAL	3.7	0.4	FS-SI	0.7	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-018	2	B	FAL	4	0.3	FS-SI	0.4	BEDFORM	0	0	2	2, TRA	0			0			0		0	
SO-019	1	B	FAL	4	0.2	FS-SI	0.6	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-019	2	B	FAL	3.7	0.4	FS-SI	0.7	BEDFORM	1, HERM	0	0	trace	0			0			0		0	
SO-020	1	B	FAL	1.5	0.2	FS-SI	0.6	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-020	2	B	FAL	4	0.2	FS-SI	1	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-021	1	B	FAL	14.2	1	FS-SI	0.3	BEDFORM	0	0	2	TRACE	0			0			0		3	1, OX 2, AN
SO-021	2	B	FAL	12	0.3	FS-SI	1.2	MOUND	0	0	1	TRACE	2	WORM	5, 3	0			0		0	

Table 6. Fall 1997 SPI analysis (Sandbridge area).

Virginia Beach Sandmining Project SPI visual analysis										Surface struct.												
						Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
			Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
SO-022	1	B	FAL	4.5	0.5	FS-SI	0.7	BEDFORM	0	0	0	1, TRAC	0			0			0		0	
SO-022	2	B	FAL	6	0.3	FS-SI	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-023	1	B	FAL	3.7	0.4	FS-SI	0.5	BEDFORM	0	1	0	TRACE	0			0			0		0	
SO-023	2	B	FAL	8	2.4	FS-SI	0.3	EVEN	1, HERMIT	0	0	TRACE	0			0			0		0	
SO-024	1	B	FAL	3.5	0.3	FS-SI	0.9	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-024	2	B	FAL	5	0.6	FS-SI	0.7	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-025	1	B	FAL	6.7	2.9	FS-SI	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-025	2	B	FAL	6.5	2.7	FS-SI	0.1	EVEN	0	0	0	2, TRAC	0			0			0		0	
SO-026	1	B	FAL	6.3	1.7	FS-SI	0.5	BEDFORM	0	1	2	TRACE	0			0			0		0	
SO-027	1	B	FAL	4.7	1.3	FS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-027	2	B	FAL	6	0.5	MS	0.5	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-028	1	B	FAL	7	ALL	MS	4	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-028	2	B	FAL	6	ALL	MS	0.4	EVEN	0	0	0	TRACE	0			0			0		0	
SO-029	1	B	FAL	6	ALL	MS	1.2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-029	2	B	FAL	6	ALL	MS	3.2	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-030	1	B	FAL	6	ALL	MS	2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-030	2	B	FAL	7	ALL	MS	4.2	SLOPE	0	0	2	TRACE	0			0			0		0	
SO-031	1	B	FAL	7	4.2	FS	0	EVEN	0	0	0	TRACE	0			0			0		0	
SO-031	2	B	FAL	6	ALL	MS	2.1	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-032	1	B	FAL	7	ALL	MS	1.2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-032	2	B	FAL	7	ALL	MS	2	MOUND	0	0	0	TRACE	0			0			0		0	

Table 6. Fall 1997 SPI analysis (Sandbridge area).

Virginia Beach Sandmining Project SPI visual analysis										Surface struct.												
						Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
			Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
SO-033	1	B	FAL	10	ALL	MS	5	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-033	2	B	FAL	9	ALL	MS	4.3	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-034	1	B	FAL	8	ALL	MS	4	MOUND	0	0	0	TRACE	0			0			0		0	
SO-034	2	B	FAL	9	ALL	MS	3.6	MOUND	0	0	0	TRACE	0			0			0		0	
SO-035	1	B	FAL	7	ALL	MS	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-035	2	B	FAL	5	ALL	FS	2.5	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-036	1	B	FAL	6	ALL	MS	0.5	BEDFORM	0	0	3	TRACE	0			0			0		0	
SO-036	2	B	FAL	7.5	3.2	FS-SI	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-036	2	B	FAL	6	2.5	MS	0.4	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-037	1	B	FAL	7	1.3	MS-SI	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-037	2	B	FAL	9	3.4	MS	2.3	SLOPE	0	0	2	TRACE	0			0			0		0	
SO-038	1	B	FAL	9	2.3	MS	2.4	MOUND	0	0	0	TRACE	0			0			0		0	
SO-038	2	B	FAL	5	ALL	MS	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-039	1	B	FAL	5.7	ALL	MS	0	EVEN	0	0	0	TRACE	0			0			0		0	
SO-039	2	B	FAL	8	ALL	FS	2.5	MOUND	0	0	1	TRACE	0			0			0		0	
SO-040	1	B	FAL	6	ALL	FS	3.8	MOUND	0	0	0	TRACE	0			0			0		0	
SO-040	2	B	FAL	5	ALL	FS	0	EVEN	0	0	0	TRACE	0			0			0		0	
SO-041	1	B	FAL	5	ALL	FS	0	EVEN	0	0	0	TRACE	0			0			0		0	
SO-041	2	B	FAL	6	0.3	FS	0.2	EVEN	0	0	3	TRACE	0			0			0		0	
SO-042	1	B	FAL	7	0.2	SI	1	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-042	2	B	FAL	7	1.3	FS-SI	0.3	BEDFORM	0	0	0	TRACE	0			0			0		0	

Table 6. Fall 1997 SPI analysis (Sandbridge area).

Virginia Beach Sandmining Project SPI visual analysis										Surface struct.												
						Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
			Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
SO-044	1	B	FAL	4.3	ALL	FS	3	EVEN	0	0	2	TRACE	0			0			0		0	
SO-044	2	B	FAL	3.7	2.5	FS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-045	1	B	FAL	6	2.3	MS	0.2	EVEN	0	0	4	TRACE	0			0			0		0	
SO-045	2	B	FAL	5.7	ALL	MS	0.2	EVEN	0	1	1	TRACE	0			0			0		0	
SO-046	1	B	FAL	7.2	ALL	FS	0.3	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-046	2	B	FAL	6	2.1	FS	0.4	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-047	1	B	FAL	6	4.2	FS-SI	0.1	EVEN	3, HERMI	0	0	TRACE	0			0			0		0	
SO-047	2	B	FAL	4	3.1	FS-SI	0.2	EVEN	0	1	0	TRACE	0			0			0		0	
SO-081	2	B	FALL	6.9	ALL	MS	1.6	BD, SHELL	0	0	0	TRACE	0			0			0		0	
SO-081	1	B	FALL	6.9	ALL	MS	0.9	BD, SHELL	0	0	0	TRACE	0			0			0		0	
SO-082	1	B	FAL	6	ALL	MS	0.2	EVEN, SHE	0	0	0	TRACE	0			1	OX	3	0		0	
SO-082	2	B	FAL	6.3	ALL	MS	2.5	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-083	1	B	FAL	7	ALL	MS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-083	2	B	FAL	5	ALL	FS	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-084	1	B	FAL	7	2.3	FS	0.5	MOUND	0	0	4	TRACE	0			0			0		0	
SO-084	2	B	FAL	7.4	2.7	FS	1.2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-084	3	B	FAL	6	ALL	FS	1.1	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-085	1	B	FAL	7	ALL	FS	1.2	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-085	2	B	FAL	6	2.7	FS	1.3	BEDFORM	1 SANDDO	0	3	TRACE	0			0			0		0	
SO-086	1	B	FAL	6	2	MS	0.8	BD, SHELL	0	0	0	5	0			0			0		0	
SO-086	2	B	FAL	6	0.2	MS	0.3	EVEN	0	0	1	1, TRA	0			0			0		0	

Table 6. Fall 1997 SPI analysis (Sandbridge area).

Virginia Beach Sandmining Project SPI visual analysis										Surface struct.												
						Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
			Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
SO-087	1	B	FAL	6.2	2.9	MS	0.4	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-087	2	B	FAL	6	ALL	FS	0.1	EVEN	0	0	0	TRACE	0			0			0		0	
SO-088	1	B	FAL	7	ALL	FS	1.4	MOUND	0	0	1	TRACE	0			0			0		0	
SO-088	2	B	FAL	8	3.2	FS	0.2	EVEN	0	0	2	TRACE	0			0			0		0	
SO-089	1	B	FAL	7	ALL	MS	1	BEDFORM	0	0	1	TRACE	0			0			0		0	
SO-089	2	B	FAL	5	ALL	FS	3.8	SLOPE	0	0	0	TRACE	0			0			0		0	
SO-090	1	B	FAL	7	ALL	FS	2	SLOPE	0	0	1	TRACE	0			0			0		0	
SO-090	2	B	FAL	6	ALL	MS	2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-091	1	B	FAL	6	2.3	MS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-091	2	B	FAL	6	2.6	MS	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-092	1	B	FAL	6.3	ALL	FS	2	BD, SLOPE	1, SANDD(	0	0	TRACE	0			0			0		0	
SO-092	2	B	FAL	7	ALL	FS	0.2	EVEN	0	0	0	TRACE	0			0			0		0	
SO-093	1	B	FAL	6.5	ALL	FS	0.5	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-093	2	B	FAL	6	ALL	FS	0.6	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-094	1	B	FAL	5.6	ALL	FS	1.2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-094	2	B	FAL	7	2.7	FS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-095	1	B	FAL	8	1.9	MS	0.8	BEDFORM	0	0	0	0	0			0			0		0	
SO-095	2	B	FAL	6	ALL	MS	0.9	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-096	1	B	FAL	6	ALL	MS	1.3	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-096	2	B	FAL	7	2.3	MS	1.2	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-097	1	B	FAL	6	1.6	MS	1	MOUND	0	0	1	TRACE	0			0			0		0	

Table 6. Fall 1997 SPI analysis (Sandbridge area).

Virginia Beach Sandmining Project SPI visual analysis										Surface struct.												
						Sed.	Sed.	Relief		--Tubes--		Subsurf	---Infauna----			Voids						
			Date	PEN	RPD	Type	Rel.	Type	Epifauna	+/-	Pellets	Shell	#	Type	Depth	#	Type	Depth	Gas	Depth	Burrow	Type
cell	rep		97	(cm)	(cm)		(cm)		(+/-)													
SO-097	2	B	FAL	7	4.2	MS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
SO-098	1	B	FAL	6	ALL	FS	1.3	MOUND	0	0	2	7	0			0			0		0	
SO-098	2	B	FAL	6	ALL	FS	0.3	EVEN	0	0	0	0	0			0			0		0	
SO-099	1	B	FAL	6	3.7	FS	0.4	BEDFORM	0	0	1	5	0			0			0		0	
SO-099	2	B	FAL	5	ALL	FS	0.8	BEDFORM	0	0	0	0	0			0			0		0	
SO-100	1	B	FAL	6	ALL	MS	1.4	BEDFORM	0	0	0	TRACE	0			0			0		0	
SO-100	2	B	FAL	5	ALL	FS	0.3	EVEN	0	0	0	TRACE	0			0			0		0	
T2	1	B	FAL	6	ALL	FS	0.4	BEDFORM	0	0	0	TRACE	0			0			0		0	
T2	2	B	FAL	6.3	ALL	MS	0.2	EVEN	0	0	0	TRACE	0			0			0		0	

Legend for SPI analysis tables 3 - 6.

Heading	Subheading	Meaning
LON		-Longitude W in decimal degrees
LAT		Latitude N in decimal degrees
cell		Sample cell (station) number ("1 - 400" are identical to "96001 - 96400" labeled on maps)
rep		Deployment number at a station
Date		Season, spr (spring) or fall (fall)
PEN		Average SPI prism window penetration depth (cm) into the sediments
RPD		Average depth (cm) of the apparent color redox potential discontinuity (RPD)
Sed. Type		Sediment type class CL = clay SI = silt SA = sand VFS = very fine sand FS = fine sand MS = medium sand CS = coarse sand GRV = gravel (granule to pebbles)
Sed. Rel.		Vertical linear extrema of the sediment-water interface (SWI) contour, difference (cm) between highest and lowest points on the surface
Relief Type		Structure origin primarily responsible for roughness (surface relief)
Epifauna	(+/-)	Presence (+) or absence (-) of epifaunal organisms at the SWI, and
		type of epifauna; GAST (gastropod), SAND DOLLAR, CRUSTACEAN
Tubes		Presence or number of tubes protruding above the sediment surface
Pellets		Presence (+ or Y or Pos.) or Absence (- or N or Neg.) of biological fecal pellets at the SWI
Subsurf. Shell		Amount of shell material mixed in with the sediments, approximate
		percentages or trace presence or absence listed
Infauna	#	Number of infaunal organisms visible in the sediments
	Type	Type of infauna visible; WORM, CRUSTACEAN
	Depth	Depth (cm) of the infauna visible below the SWI
Voids	#	Number of water filled voids
	Type	Type of void
	Depth	Depth (cm) of water filled void below SWI
Gas		Number of gas filled voids
	Depth	Depth (cm) of gas void below SWI
Burrow		Infaunal burrow structures evident in the image
	Type	Oxidized (OX) or anoxic (AN) sediments in and around burrow

Table 7. Sediment grain size analysis for samples from Spring, 1997.

Sample	Date MMDDYY	TS (%)	Alkalinity (meq/g)	Total Weight (g)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
96013	61897	80.5	2.0	8.01	0	0	100	0
96024	61897	76.8	3.2	13.295	0	9.5149	90.4851	0
96049	61897	86.5	1.8	15.32	0	0	10	0
96066	61897	75.5	3.2	6.505	10.146	21.1376	68.7164	0
96104	61897	70.8	4.8	10.475	1.1933	11.9332	86.8735	0
96106	61897	49.6	11.4	6.05	11.4876	16.4463	72.0661	0
96115	61897	84.1	1.8	13.39	0	0	100	0
96137	61897	91.1	1.8	12.03	0	0	72.818	27.18
96174	61897	76.8	4.0	12.36	0	2.9126	97.0874	0
96185	61897	79.9	2.0	11.2	0	0	100	0
96194	61897	81.8	1.8	11.55	0	0	100	0
96201	61897	82.9	1.4	11.4	0	0	100	0
96205	61897	80.2	1.6	16.53	0	0	100	0
96209	61897	83.2	1.8	13.3	0	0	100	0
96234	61997	84.0	1.2	10.98	0	0	100	0
96246	61997	75.7	1.0	12.27	0	0	100	0
96255	61997	76.6	1.8	11.82	0	0	96.0237	3.98
96316	61897	86.4	1.8	13.55	0	0	99.0406	0.96
96332	61897	76.6	2.6	8.89	0	8.2115	91.7885	0
96347	61897	87.7	1.2	15.97	0	0	100	0
96353	61897	92.1	1.2	12.51	0	0	58.753	41.25
96365	61897	85.6	1.6	14.15	0	0	83.7456	16.25
97076	61897	85.7	1.0	11.11	0	0	100	0
97088	61897	89.6	3.4	12.34	0	0	98.1361	1.86
97096	61897	84.6	1.8	16.47	0	0	45.7802	54.22
97104	61897	84.9	4.8	14.48	0	0	93.232	6.77
97107	61897	75.3	1.6	13.685	0	3.9094	87.9795	8.11

Table 8. Habitat class determinations identified using SPI images spring and fall 1996.

Class	Origin of primary characteristics	Modal sediment type	General description
A	Biological	Silt to silty-clay	Silty mud with high abundance of large infauna and infaunal living structrures, and sediment fabric generally dilated and bioturbated, apparent as color discontinuities or water filled void regions in sediment profile images (SPI)
B	Physical	Silt to sandy-clayey-silt	Silt to sandy-clayey-silt with little or no faunal presence or activity, sediment fabric not bioturbated
C	Combination biological and physical	Silty fine-sand to very fine sand	Silty fine sand to fine sand with variable faunal presence or activity; evidence of some biological activities, but biological features compose less than half of apparent features in the image
D	Physical	Fine to medium sand	Fine to medium sand with little or no faunal or biological feature presence
E	Biological	Fine to medium sand	Fine to medium sand with most apparent features biologically constructed
F	Physical	Medium to coarse sand and shell	Medium to coarse sand mixed with biogenic calcareous shell material, but little or no active faunal presence
G	Biological	Medium to coarse sand and shell	Medium to coarse sand mixed with shell material, and active faunal structures or presence of fauna
H	Physical	Coarse sand to gravel	Coarse sand to gravel with little or no apparent biological activity or recent structures
I	Physical/Transitional	Coarse sediments layered over fine	Layered sediments, where coarse grain-size material has been deposited over fine material, and active biological features are absent; observed: fine sand over clay, very fine sand over clay, and medium sand over clay

Table 9. Counts (number of cells in which the habitat class was present) and percentages of habitat class determinations identified using SPI images spring and fall 1996.

Spring 1996

Class	Cell Count	Percentage
A	15	9.6
B	0	0.0
C	73	46.6
D	31	19.8
E	10	6.1
F	15	9.6
G	9	5.4
H	5	2.9
I	0	0.0
Total	157	100.0

Fall 1996

Class	Cell Count	Percentage
A	12	6.3
B	3	1.6
C	100	52.1
D	39	20.4
E	5	2.6
F	28	14.7
G	0	0.0
H	2	1.0
I	3	1.3
Total	191	100.0

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL		Spr. 96	Fall 96		Spr. 96	Fall 96		
-75.9388333	36.882	1		C	C		COMBI	COMBI		
-75.9398333	36.883	1		C	C		COMBI	COMBI		
-75.9316667	36.882	3		A	C		BIO	COMBI		
-75.9326667	36.883	3		A	C		BIO	COMBI		
-75.9225	36.882	5		D			PHYS			
-75.9235	36.883	5		D			PHYS			
-75.9141667	36.882	7		G			BIO			
-75.9151667	36.883	7		G			BIO			
-75.9073333	36.883	9		G	E		BIO	BIO		
-75.9063333	36.882	9		G	B		BIO	PHYS		
-75.9336667	36.8783333	12		A	C		BIO	COMBI		
-75.9346667	36.8793333	12		A	C		BIO	COMBI		
-75.9268333	36.8793333	14		A	E		BIO	BIO		
-75.9258333	36.8783333	14		A	D		BIO	PHYS		
-75.9175	36.8783333	16		A	C		BIO	COMBI		
-75.9185	36.8793333	16		A	C		BIO	COMBI		
-75.9091667	36.8783333	18		G	F		BIO	PHYS		
-75.9101667	36.8793333	18		G	F		BIO	PHYS		
-75.9	36.8783333	20		G	D		BIO	PHYS		
-75.901	36.8793333	20		G	D		BIO	PHYS		
-75.9366667	36.8741667	21		C	C		COMBI	COMBI		
-75.9376667	36.8751667	21		C	C		COMBI	COMBI		
-75.9283333	36.8741667	23		A	A		BIO	BIO		
-75.9293333	36.8751667	23		A	A		BIO	BIO		
-75.9203333	36.8741667	25		G	A		BIO	BIO		
-75.9213333	36.8751667	25		G	A		BIO	BIO		
-75.9116667	36.8741667	27		D	F		PHYS	PHYS		
-75.9126667	36.8751667	27		F	F		PHYS	PHYS		
-75.9033333	36.8741667	29		F	F		PHYS	PHYS		
-75.9043333	36.8751667	29		F	F		PHYS	PHYS		
-75.9326667	36.871	32		A	C		BIO	COMBI		
-75.9316667	36.87	32		C	C		COMBI	COMBI		
-75.9316667	36.87	32		A			BIO			
-75.9243333	36.871	34		G	D		BIO	PHYS		
-75.9233333	36.87	34		G	D		BIO	PHYS		
-75.916	36.871	36		G	D		BIO	PHYS		
-75.915	36.87	36		G	F		BIO	PHYS		
-75.9075	36.87	38		E	A		BIO	BIO		
-75.9085	36.871	38		E			BIO			
-75.8993333	36.871	40		F	D		PHYS	PHYS		
-75.8983333	36.87	40		F	D		PHYS	PHYS		
-75.9351667	36.8676667	41		C	C		COMBI	COMBI		
-75.9341667	36.8666667	41		C	C		COMBI	COMBI		
-75.9268333	36.8676667	43		C	A		COMBI	BIO		
-75.9258333	36.8666667	43		C	A		COMBI	BIO		
-75.9185	36.8676667	45		D	D		PHYS	PHYS		
-75.9185	36.8676667	45			D			PHYS		
-75.9175	36.8666667	45		E			BIO			
-75.91	36.8666667	47		A	B		BIO	PHYS		
-75.911	36.8676667	47		G	D		BIO	PHYS		
-75.9026667	36.8676667	49		E	D		BIO	PHYS		

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL	Spr. 96	Fall 96	Spr. 96	Fall 96
-75.9016667	36.8666667	49	D	D	PHYS	PHYS
-75.9283333	36.8621667	52	A	A	BIO	BIO
-75.9293333	36.8631667	52	A	A	BIO	BIO
-75.9208333	36.8621667	54	E	D	BIO	PHYS
-75.9218333	36.8631667	54	E	D	BIO	PHYS
-75.9143333	36.8631667	56	G	D	BIO	PHYS
-75.9133333	36.8621667	56	F	D	PHYS	PHYS
-75.9033333	36.8621667	58	E	A	BIO	BIO
-75.9043333	36.8631667	58	E	A	BIO	BIO
-75.9291667	36.8621667	60	F	D	PHYS	PHYS
-75.9301667	36.8631667	60	F	D	PHYS	PHYS
-75.9316667	36.8583333	61		C		COMBI
-75.9326667	36.8593333	61		C		COMBI
-75.9241667	36.8583333	63	A	A	BIO	BIO
-75.9251667	36.8593333	63	A	A	BIO	BIO
-75.9158333	36.8583333	65	E	I	BIO	PHYS
-75.9168333	36.8593333	65	E	I	BIO	PHYS
-75.9075	36.8583333	67	D	D	PHYS	PHYS
-75.9085	36.8593333	67	D	D	PHYS	PHYS
-75.9001667	36.8593333	69	E	D	BIO	PHYS
-75.8991667	36.8583333	69	G	D	BIO	PHYS
-75.9258333	36.8541667	72	C	C	COMBI	COMBI
-75.9268333	36.8551667	72	C	C	COMBI	COMBI
-75.9183333	36.8541667	74	D	D	PHYS	PHYS
-75.9193333	36.8551667	74	D		PHYS	
-75.91	36.8541667	76	E	D	BIO	PHYS
-75.911	36.8551667	76	D	D	PHYS	PHYS
-75.9026667	36.8551667	78	A	C	BIO	COMBI
-75.9016667	36.8541667	78	C	D	COMBI	PHYS
-75.8933333	36.8541667	80	E	D	BIO	PHYS
-75.8943333	36.8551667	80	E	D	BIO	PHYS
-75.93	36.8508333	81		C		COMBI
-75.931	36.8518333	81		C		COMBI
-75.9226667	36.8518333	83	A	A	BIO	BIO
-75.9216667	36.8508333	83	A	I	BIO	PHYS
-75.9133333	36.8508333	85	D	D	PHYS	PHYS
-75.9143333	36.8518333	85	D	D	PHYS	PHYS
-75.906	36.8518333	87	C	C	COMBI	COMBI
-75.905	36.8508333	87	D	C	PHYS	COMBI
-75.8958333	36.8508333	89	E	D	BIO	PHYS
-75.8968333	36.8518333	89	E	D	BIO	PHYS
-75.9233333	36.8466667	92		D		PHYS
-75.9243333	36.8476667	92		D		PHYS
-75.9166667	36.8466667	94	E	E	BIO	BIO
-75.9176667	36.8476667	94	D	D	PHYS	PHYS
-75.9093333	36.8476667	96	C	C	COMBI	COMBI
-75.9083333	36.8466667	96	D	B	PHYS	PHYS
-75.9001667	36.8476667	98	E	C	BIO	COMBI
-75.8991667	36.8466667	98	E	D	BIO	PHYS
-75.8908333	36.8466667	100	C	C	COMBI	COMBI
-75.8918333	36.8476667	100	C	C	COMBI	COMBI
-75.9266667	36.8433333	101		C		COMBI

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL	Spr. 96	Fall 96	Spr. 96	Fall 96
-75.9276667	36.8443333	**101**		**C**		**COMBI**
-75.9201667	36.8443333	**103**		**A**		**BIO**
-75.9191667	36.8433333	**103**		**C**		**COMBI**
-75.9108333	36.8433333	**105**		**D**		**PHYS**
-75.9118333	36.8443333	**105**		**D**		**PHYS**
-75.903	36.8433333	**107**		**C**		**COMBI**
-75.904	36.8443333	**107**		**C**		**COMBI**
-75.8938333	36.8433333	**109**	**C**	**E**	**COMBI**	**BIO**
-75.8948333	36.8443333	**109**	**C**	**E**	**COMBI**	**BIO**
-75.9216667	36.8391667	**112**		**E**		**BIO**
-75.9226667	36.8401667	**112**		**D**		**PHYS**
-75.9151667	36.8401667	**114**		**E**		**BIO**
-75.9141667	36.8391667	**114**		**D**		**PHYS**
-75.9058333	36.8391667	**116**		**C**		**COMBI**
-75.9068333	36.8401667	**116**		**D**		**PHYS**
-75.897	36.8391667	**118**		**C**		**COMBI**
-75.898	36.8401667	**118**		**C**		**COMBI**
-75.8883333	36.8391667	**120**	**A**	**C**	**BIO**	**COMBI**
-75.8893333	36.8401667	**120**	**A**	**C**	**BIO**	**COMBI**
-75.9241667	36.8358333	**121**	**D**	**D**	**PHYS**	**PHYS**
-75.9251667	36.8368333	**121**	**D**	**D**	**PHYS**	**PHYS**
-75.9168333	36.8368333	**123**	**C**	**D**	**COMBI**	**PHYS**
-75.9158333	36.8358333	**123**	**D**	**D**	**PHYS**	**PHYS**
-75.9093333	36.8368333	**125**		**C**		**COMBI**
-75.9083333	36.8358333	**125**		**D**		**PHYS**
-75.9	36.8358333	**127**		**E**		**BIO**
-75.901	36.8368333	**127**		**F**		**PHYS**
-75.8916667	36.8358333	**129**		**C**		**COMBI**
-75.8926667	36.8368333	**129**		**C**		**COMBI**
-75.92	36.8316667	**132**	**C**	**C**	**COMBI**	**COMBI**
-75.921	36.8326667	**132**	**C**	**C**	**COMBI**	**COMBI**
-75.9116667	36.8316667	**134**	**D**	**D**	**PHYS**	**PHYS**
-75.9126667	36.8326667	**134**		**D**		**PHYS**
-75.9033333	36.8316667	**136**		**F**		**PHYS**
-75.9043333	36.8326667	**136**		**F**		**PHYS**
-75.8966667	36.8316667	**138**		**F**		**PHYS**
-75.8976667	36.8326667	**138**		**F**		**PHYS**
-75.8858333	36.8316667	**140**	**D**	**F**	**PHYS**	**PHYS**
-75.8868333	36.8326667	**140**		**F**		**PHYS**
-75.9225	36.828	**141**	**D**	**E**	**PHYS**	**BIO**
-75.9235	36.829	**141**	**D**	**E**	**PHYS**	**BIO**
-75.9141667	36.828	**143**	**C**	**C**	**COMBI**	**COMBI**
-75.9151667	36.829	**143**	**C**	**C**	**COMBI**	**COMBI**
-75.9066667	36.828	**145**	**D**	**D**	**PHYS**	**PHYS**
-75.9076667	36.829	**145**	**D**	**D**	**PHYS**	**PHYS**
-75.8978333	36.828	**147**		**F**		**PHYS**
-75.8988333	36.829	**147**		**F**		**PHYS**
-75.8891667	36.828	**149**		**A**		**BIO**
-75.8901667	36.829	**149**		**A**		**BIO**
-75.9158333	36.8236667	**152**	**D**	**D**	**PHYS**	**PHYS**
-75.9168333	36.8246667	**152**	**D**	**D**	**PHYS**	**PHYS**
-75.9083333	36.8236667	**154**	**C**	**D**	**COMBI**	**PHYS**

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL		Spr. 96	Fall 96		Spr. 96	Fall 96		
-75.9093333	36.8246667	154		C	D		COMBI	PHYS		
-75.9	36.8236667	156		F	D		PHYS	PHYS		
-75.901	36.8246667	156		F	D		PHYS	PHYS		
-75.8925	36.8236667	158			F			PHYS		
-75.8935	36.8246667	158			F			PHYS		
-75.8833333	36.8236667	160			D			PHYS		
-75.8843333	36.8246667	160			D			PHYS		
-75.92	36.8196667	161		C	C		COMBI	COMBI		
-75.921	36.8206667	161			C			COMBI		
-75.9133333	36.8196667	163		D	C		PHYS	COMBI		
-75.9143333	36.8206667	163		D	C		PHYS	COMBI		
-75.9041667	36.8196667	165		D	C		PHYS	COMBI		
-75.9051667	36.8206667	165		D	C		PHYS	COMBI		
-75.8968333	36.8206667	167		H	D		PHYS	PHYS		
-75.8958333	36.8196667	167		H	F		PHYS	PHYS		
-75.8866667	36.8196667	169			B			PHYS		
-75.8876667	36.8206667	169			B			PHYS		
-75.9141667	36.8158333	172		C	C		COMBI	COMBI		
-75.9151667	36.8168333	172			C			COMBI		
-75.9076667	36.8168333	174		D	C		PHYS	COMBI		
-75.9066667	36.8158333	174		D	I		PHYS	PHYS		
-75.8985	36.8168333	176		D	D		PHYS	PHYS		
-75.8975	36.8158333	176		F	D		PHYS	PHYS		
-75.8891667	36.8158333	178		C	C		COMBI	COMBI		
-75.8901667	36.8168333	178		C	C		COMBI	COMBI		
-75.8816667	36.8158333	180			C			COMBI		
-75.8826667	36.8168333	180			C			COMBI		
-75.9166667	36.8116667	181		C	C		COMBI	COMBI		
-75.9176667	36.8126667	181		C	C		COMBI	COMBI		
-75.9083333	36.8116667	183		C	C		COMBI	COMBI		
-75.9093333	36.8126667	183			C			COMBI		
-75.9008333	36.8116667	185		C	C		COMBI	COMBI		
-75.9018333	36.8126667	185		C	C		COMBI	COMBI		
-75.8925	36.8116667	187		C	C		COMBI	COMBI		
-75.8935	36.8126667	187		C			COMBI			
- -75.8925	36.8116667	187		C			COMBI			
-75.8851667	36.8126667	189			C			COMBI		
-75.8841667	36.8116667	189			C			COMBI		
-75.9126667	36.809	192			C			COMBI		
-75.9116667	36.808	192			C			COMBI		
-75.9043333	36.809	194		C	C		COMBI	COMBI		
-75.9033333	36.808	194			C			COMBI		
-75.896	36.809	196		C	C		COMBI	COMBI		
-75.895	36.808	196		C	C		COMBI	COMBI		
-75.8885	36.809	198			C			COMBI		
-75.8875	36.808	198			C			COMBI		
-75.8793333	36.809	200			C			COMBI		
-75.8783333	36.808	200			C			COMBI		
-75.886	36.9093333	201		C	C		COMBI	COMBI		
-75.885	36.9083333	201		C	C		COMBI	COMBI		
-75.8776667	36.9093333	203		C	C		COMBI	COMBI		
-75.8766667	36.9083333	203		C	C		COMBI	COMBI		

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL		Spr. 96	Fall 96		Spr. 96	Fall 96		
-75.8685	36.9093333	**205**		C	C		COMBI	COMBI		
-75.8675	36.9083333	**205**		C	C		COMBI	COMBI		
-75.8685	36.9093333	**205**		C			COMBI			
-75.86	36.9083333	**207**		C			COMBI			
-75.861	36.9093333	**207**		C			COMBI			
-75.8508333	36.9083333	**209**		C			COMBI			
-75.8518333	36.9093333	**209**		C			COMBI			
-75.8508333	36.9083333	**209**		C			COMBI			
-75.8806667	36.9063333	**212**		C	C		COMBI	COMBI		
-75.8796667	36.9053333	**212**		C	C		COMBI	COMBI		
-75.8718333	36.9063333	**214**		C	C		COMBI	COMBI		
-75.8708333	36.9053333	**214**		C	C		COMBI	COMBI		
-75.8638333	36.9063333	**216**		C	C		COMBI	COMBI		
-75.8628333	36.9053333	**216**		C	C		COMBI	COMBI		
-75.8551667	36.9063333	**218**			C			COMBI		
-75.8541667	36.9053333	**218**			C			COMBI		
-75.8468333	36.9063333	**220**		C	C		COMBI	COMBI		
-75.8458333	36.9053333	**220**		C	C		COMBI	COMBI		
-75.8468333	36.9063333	**220**		C			COMBI			
-75.8825	36.902	**221**			C			COMBI		
-75.8835	36.903	**221**			C			COMBI		
-75.8741667	36.902	**223**		C	C		COMBI	COMBI		
-75.8751667	36.903	**223**		C	C		COMBI	COMBI		
-75.8741667	36.902	**223**		C			COMBI			
-75.8668333	36.903	**225**		C	C		COMBI	COMBI		
-75.8658333	36.902	**225**		C	C		COMBI	COMBI		
-75.8576667	36.903	**227**		C	C		COMBI	COMBI		
-75.8566667	36.902	**227**		C	C		COMBI	COMBI		
-75.8493333	36.903	**229**		C	C		COMBI	COMBI		
-75.8483333	36.902	**229**		C	C		COMBI	COMBI		
-75.8785	36.8993333	**232**		C	C		COMBI	COMBI		
-75.8775	36.8983333	**232**		C			COMBI			
-75.8785	36.8993333	**232**		C			COMBI			
-75.8691667	36.8983333	**234**		C	C		COMBI	COMBI		
-75.8701667	36.8993333	**234**		C	C		COMBI	COMBI		
-75.8603333	36.8983333	**236**		C	C		COMBI	COMBI		
-75.8613333	36.8993333	**236**		C	C		COMBI	COMBI		
-75.8603333	36.8983333	**236**		C			COMBI			
-75.8526667	36.8993333	**238**		C	C		COMBI	COMBI		
-75.8516667	36.8983333	**238**		C	C		COMBI	COMBI		
-75.8443333	36.8993333	**240**		C	C		COMBI	COMBI		
-75.8433333	36.8983333	**240**		C	C		COMBI	COMBI		
-75.8818333	36.8951667	**241**			C			COMBI		
-75.8808333	36.8941667	**241**			C			COMBI		
-75.8726667	36.8951667	**243**		C	C		COMBI	COMBI		
-75.8716667	36.8941667	**243**		C	C		COMBI	COMBI		
-75.8633333	36.8941667	**245**		C	C		COMBI	COMBI		
-75.8643333	36.8951667	**245**			C			COMBI		
-75.856	36.8951667	**247**		C	C		COMBI	COMBI		
-75.855	36.8941667	**247**		C	C		COMBI	COMBI		
-75.8471667	36.8951667	**249**		C	C		COMBI	COMBI		
-75.8461667	36.8941667	**249**		C	C		COMBI	COMBI		

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL		Spr. 96	Fall 96		Spr. 96	Fall 96		
-75.876	36.8918333	**252**			C			COMBI		
-75.875	36.8908333	**252**			C			COMBI		
-75.8676667	36.8918333	**254**		C	C		COMBI	COMBI		
-75.8666667	36.8908333	**254**		C	C		COMBI	COMBI		
-75.8593333	36.8918333	**256**		C	C		COMBI	COMBI		
-75.8583333	36.8908333	**256**		C	C		COMBI	COMBI		
-75.8506667	36.8918333	**258**		C	C		COMBI	COMBI		
-75.8496667	36.8908333	**258**		C	C		COMBI	COMBI		
-75.8506667	36.8918333	**258**		C			COMBI			
-75.8408333	36.8908333	**260**		C	C		COMBI	COMBI		
-75.8418333	36.8918333	**260**		C	C		COMBI	COMBI		
-75.8775	36.8866667	**261**			C			COMBI		
-75.8785	36.8876667	**261**			C			COMBI		
-75.8691667	36.8866667	**263**			C			COMBI		
-75.8701667	36.8876667	**263**			C			COMBI		
-75.8608333	36.8866667	**265**		C	C		COMBI	COMBI		
-75.8618333	36.8876667	**265**		C	C		COMBI	COMBI		
-75.8525	36.8866667	**267**		C	C		COMBI	COMBI		
-75.8535	36.8876667	**267**			C			COMBI		
-75.8441667	36.8866667	**269**		C	C		COMBI	COMBI		
-75.8451667	36.8876667	**269**		C	C		COMBI	COMBI		
-75.8725	36.8825	**272**			C			COMBI		
-75.8735	36.8835	**272**			C			COMBI		
-75.8638333	36.8825	**274**			C			COMBI		
-75.8648333	36.8835	**274**			C			COMBI		
-75.855	36.8825	**276**		C	C		COMBI	COMBI		
-75.856	36.8835	**276**		C	C		COMBI	COMBI		
-75.8466667	36.8825	**278**		C	C		COMBI	COMBI		
-75.8476667	36.8835	**278**		C			COMBI			
-75.8383333	36.8825	**280**		C	C		COMBI	COMBI		
-75.8393333	36.8835	**280**		C	C		COMBI	COMBI		
-75.875	36.8783333	**281**			C			COMBI		
-75.876	36.8793333	**281**			C			COMBI		
-75.8666667	36.8783333	**283**			C			COMBI		
-75.8676667	36.8793333	**283**			C			COMBI		
-75.8583333	36.8783333	**285**			C			COMBI		
-75.8593333	36.8793333	**285**			C			COMBI		
-75.8496667	36.8783333	**287**		C	C		COMBI	COMBI		
-75.8506667	36.8793333	**287**		C	C		COMBI	COMBI		
-75.8408333	36.8783333	**289**		C	C		COMBI	COMBI		
-75.8418333	36.8793333	**289**		C	C		COMBI	COMBI		
-75.87	36.8741667	**292**			C			COMBI		
-75.871	36.8751667	**292**			C			COMBI		
-75.8616667	36.8741667	**294**			C			COMBI		
-75.8626667	36.8751667	**294**			C			COMBI		
-75.8533333	36.8741667	**296**			C			COMBI		
-75.8543333	36.8751667	**296**			C			COMBI		
-75.8441667	36.8741667	**298**		C	C		COMBI	COMBI		
-75.8451667	36.8751667	**298**		C	C		COMBI	COMBI		
-75.8363333	36.8741667	**300**		C	C		COMBI	COMBI		
-75.8373333	36.8751667	**300**		C	C		COMBI	COMBI		
-75.9033333	36.7613333	**301**		C			COMBI			

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL		Spr. 96	Fall 96		Spr. 96	Fall 96		
-75.9043333	36.7623333	301		C			COMBI			
-75.8958333	36.7613333	303		A	C		BIO	COMBI		
-75.8968333	36.7623333	303		A	C		BIO	COMBI		
-75.8883333	36.7613333	305		D	F		PHYS	PHYS		
-75.8893333	36.7623333	305		D	F		PHYS	PHYS		
-75.8796667	36.7613333	307		D	F		PHYS	PHYS		
-75.8806667	36.7623333	307		D	F		PHYS	PHYS		
-75.8708333	36.7613333	309		D	F		PHYS	PHYS		
-75.8718333	36.7623333	309		D	F		PHYS	PHYS		
-75.8983333	36.758	312		A	C		BIO	COMBI		
-75.8993333	36.759	312		C	C		COMBI	COMBI		
-75.8908333	36.758	314		A	A		BIO	BIO		
-75.8918333	36.759	314		A	A		BIO	BIO		
-75.8825	36.758	316		D	F		PHYS	PHYS		
-75.8835	36.759	316		D	F		PHYS	PHYS		
-75.8741667	36.758	318		D	D		PHYS	PHYS		
-75.8751667	36.759	318		D	D		PHYS	PHYS		
-75.8658333	36.758	320		D	F		PHYS	PHYS		
-75.8668333	36.759	320		D	F		PHYS	PHYS		
-75.9016667	36.7533333	321		C	C		COMBI	COMBI		
-75.9026667	36.7543333	321		C	C		COMBI	COMBI		
-75.8945	36.7533333	323		C	C		COMBI	COMBI		
-75.8955	36.7543333	323		C	C		COMBI	COMBI		
-75.8863333	36.7533333	325		D	F		PHYS	PHYS		
-75.8873333	36.7543333	325		D	F		PHYS	PHYS		
-75.878	36.7533333	327		D	F		PHYS	PHYS		
-75.879	36.7543333	327		D	F		PHYS	PHYS		
-75.8695	36.7533333	329		D	D		PHYS	PHYS		
-75.8705	36.7543333	329			D			PHYS		
-75.8958333	36.75	332		C	C		COMBI	COMBI		
-75.8968333	36.751	332		C	C		COMBI	COMBI		
-75.8875	36.75	334		D	F		PHYS	PHYS		
-75.8885	36.751	334		D	F		PHYS	PHYS		
-75.8808333	36.75	336		F	F		PHYS	PHYS		
-75.8818333	36.751	336		F	F		PHYS	PHYS		
-75.8716667	36.75	338		D	D		PHYS	PHYS		
-75.8726667	36.751	338		D	D		PHYS	PHYS		
-75.8633333	36.75	340		A	D		BIO	PHYS		
-75.8643333	36.751	340			F			PHYS		
-75.8991667	36.7458333	341		C	C		COMBI	COMBI		
-75.9001667	36.7468333	341		C	C		COMBI	COMBI		
-75.8908333	36.7458333	343		A	A		BIO	BIO		
-75.8918333	36.7468333	343		A	A		BIO	BIO		
-75.8825	36.7458333	345		F	F		PHYS	PHYS		
-75.8835	36.7468333	345		F	F		PHYS	PHYS		
-75.8741667	36.7458333	347		D	D		PHYS	PHYS		
-75.8751667	36.7468333	347		D	D		PHYS	PHYS		
-75.8666667	36.7458333	349		C	D		COMBI	PHYS		
-75.8676667	36.7468333	349		C	D		COMBI	PHYS		
-75.8933333	36.7416667	352		C	C		COMBI	COMBI		
-75.8943333	36.7426667	352		C	C		COMBI	COMBI		
-75.8876667	36.7426667	354		F	F		PHYS	PHYS		

Table 10. Habitat classifications and types for 1996 SPI images.

-LON	LAT	CELL		Spr. 96	Fall 96		Spr. 96	Fall 96		
-75.8866667	36.7416667	354		H	F		PHYS	PHYS		
-75.8783333	36.7416667	356		D	D		PHYS	PHYS		
-75.8793333	36.7426667	356		D	D		PHYS	PHYS		
-75.871	36.7426667	358		C	C		COMBI	COMBI		
-75.87	36.7416667	358			C			COMBI		
-75.8608333	36.7416667	360		F	F		PHYS	PHYS		
-75.8618333	36.7426667	360			F			PHYS		
-75.8966667	36.738	361		C	C		COMBI	COMBI		
-75.8976667	36.739	361			C			COMBI		
-75.8888333	36.738	363		H	H		PHYS	PHYS		
-75.8898333	36.739	363		H	H		PHYS	PHYS		
-75.8808333	36.738	365		F	C		PHYS	COMBI		
-75.8818333	36.739	365		F	F		PHYS	PHYS		
-75.8725	36.738	367		C	C		COMBI	COMBI		
-75.8735	36.739	367			C			COMBI		
-75.8646667	36.738	369			C			COMBI		
-75.8656667	36.739	369		C	B		COMBI	PHYS		
-75.8916667	36.7333333	372		C	A		COMBI	BIO		
-75.8926667	36.7343333	372		C	C		COMBI	COMBI		
-75.8833333	36.7333333	374		F	D		PHYS	PHYS		
-75.8843333	36.7343333	374		F			PHYS			
-75.8758333	36.7333333	376		F	F		PHYS	PHYS		
-75.8768333	36.7343333	376		F	F		PHYS	PHYS		
-75.8675	36.7333333	378		C			COMBI			
-75.8685	36.7343333	378		C			COMBI			
-75.8591667	36.7333333	380		F	F		PHYS	PHYS		
-75.8601667	36.7343333	380		F	F		PHYS	PHYS		
-75.8941667	36.73	381		C	C		COMBI	COMBI		
-75.8951667	36.731	381		C	C		COMBI	COMBI		
-75.8866667	36.73	383		H	H		PHYS	PHYS		
-75.8876667	36.731	383		H	H		PHYS	PHYS		
-75.8801667	36.731	385		F	F		PHYS	PHYS		
-75.8791667	36.73	385			F			PHYS		
-75.8708333	36.73	387		D	C		PHYS	COMBI		
-75.8718333	36.731	387		D	C		PHYS	COMBI		
-75.8625	36.73	389		F	F		PHYS	PHYS		
-75.8635	36.731	389		F	F		PHYS	PHYS		
-75.8933333	36.7258333	392		C	C		COMBI	COMBI		
-75.8943333	36.7268333	392		C	C		COMBI	COMBI		
-75.885	36.7258333	394		H	F		PHYS	PHYS		
-75.886	36.7268333	394		H	I		PHYS	PHYS		
-75.8766667	36.7258333	396		D	D		PHYS	PHYS		
-75.8776667	36.7268333	396		D	D		PHYS	PHYS		
-75.865	36.7258333	398		C	A		COMBI	BIO		
-75.866	36.7268333	398		C	A		COMBI	BIO		
-75.8566667	36.7258333	400		F	F		PHYS	PHYS		
-75.8576667	36.7268333	400		F	F		PHYS	PHYS		

Table 11. Complete taxonomic list from 13 processed Smith-MacIntyre grab samples from June and November 1996 collections.

Nemerteans
- Nemertean

Anemones
- Anemones, Burrowing

Platyhelmenths
- Flat worm
- *Stylochus* sp.

Molluscs
- Gastropods
  - Gastropod
  - *Acteocina canaliculata*
  - *Epitonium multistriatum*
  - *Haminoea solitaria*
  - *Mangelia cerina*
  - *Nassarius trivitattus*
  - *Polinices duplicatus*
  - *Pyramidella candida*
  - *Tectonatica pusilla*
  - *Turbonilla interupta*
- Bivalves
  - Bivalva
  - *Brania clavata*
  - *Brania wellfleetensis*
  - *Brania* sp.
  - *Ensis directus*
  - *Lyonsia hyalina*
  - *Macoma tenta*
  - *Macoma* sp.
  - *Pandora trilineata*
  - *Spisula solidissima*
  - *Tellina agilis*

Arthropods
- Tanaids
  - *Heterotanais* sp.
- Isopods
  - Isopod
  - *Chiridotea tuftsi*
  - *Cirolana concharum*
  - *Ptilanthura tenuis*
- Cumaceans
  - *Campylaspis* sp.
  - *Leucon americanus*
  - *Oxyurostylis smithi*

Table . Continued.

Amphipods
- Amphipod
- *Acanthohaustorius millsi*
- *Ampelisca abdita*
- *Ampelisca verrilli*
- *Batea catharinensis*
- *Bathyporeia porteri*
- *Corophium tuberculatum*
- *Lepidactylus dytiscus*
- *Paraphoxus spinosus*
- *Pontocrates* sp.
- *Protohaustorius wigleyi*
- *Synchelidium americanum*
- *Trichophoxus epistomus*
- *Unciola irrorata*

Decapods
- Decapod
- *Crangon septemspinosus*
- *Pagurus longicarpus*
- *Panopeus herbstii*
- *Pinixia retinens*

Annelids

Oligochaetes
- Tubificidae

Polychaetes
- *Aglaophamus verrilli*
- *Amastigos caperatus*
- *Ampharete acutifrons*
- *Ancistrosyllis hartmanae*
- *Aphrodita hastata*
- *Aricidea jeffreysii*
- *Aricidea wassi*
- *Asabellides oculata*
- *Asychis elongata*
- *Bhwania goodei*
- *Capitomastus aciculatus*
- *Clymenella mucosa*
- *Clymenella torquata*
- *Clymenella* sp.
- *Drilonereis magna*
- *Euclymene zonalis*
- *Exogone dispar*
- *Glycera americana*
- *Glycera dibranchiata*
- *Glycera robustus*
- *Harmathoe nodosa*
- *Harmathoe* sp.

Table . Completed.

Polychaetes (continued)
Lumbrinereis acuta
Lumbrinereis tenuis
Magelona rosea
Maldanopsis elongata
Mangelia cerira
Mediomastus ambiseta
Mediomastus sp.
Nephtys bucera
Nephtys cryptomma
Nephtys incisa
Nephtys picta
Notomastus hemipodus
Notomastus sp.
Notomustus latericeus
Orbinia ornata
Owenia fusiformis
Paleanotus heteroseta
Paraonis fulgeus
Parapionosyllis manca
Phyllodoce arenae
Phyllodoce mucosa
Pista palmata
Podarke obseura
Polydora ligni
Prionospio malmgreni
Protodorvillea egena
Pseudeurythoe paucibranchiata
Scolelepis squamata
Sigalion arenicolae
Sigambra tentaculata
Spio setosa
Spiochaetopterus oculatus
Spiophanes bombyx
Stauronereis rudolphi
Sthenelais limicola
Tharyx setigera

Phoronids
Phoronis spp.

Echinoderms
Arbacia punctulata
Cucumaria pulcherrima
Mellita quinquiesperforata

Hemichordates
Hemichordate

Cordates
Branchiostoma caribaeum

Table 12. Species data from 13 of the Smith-MacIntyre grabs collected in 1996.

Station	336	336	342	347	347	353	353	361	361	372	372	377	396	
Taxa Date	Jun	Nov	Jun	Jun	Nov	Jun	Nov	Jun	Nov	Jun	Nov	Jun	Nov	Total
Acanthohaustorius millsi	2	3	0	2	0	0	0	0	0	0	0	0	2	9
Acteocina canaliculata	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Aglaophamus verrilli	0	1	18	0	0	0	0	21	42	21	34	2	0	139
Amastigos caperatus	0	0	0	0	0	0	1	7	0	1	0	0	0	9
Ampelisca abdita	0	0	1	0	0	0	0	0	3	0	24	0	0	28
Ampelisca verrilli	0	0	0	0	0	0	0	4	26	0	0	0	0	30
Ampharete acutifrons	0	0	0	0	0	2	0	0	0	0	0	0	0	2
Amphipod	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Ancistrosyllis hartmanae	0	0	0	0	0	3	0	0	0	0	0	1	0	4
Anemones, Burrowing	0	0	0	0	0	0	0	5	0	0	0	0	0	5
Aphrodita hastata	0	1	0	1	0	0	0	0	0	0	0	0	0	2
Arbacia punctulata	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Aricidea jeffreysii	1	0	0	5	1	4	0	0	0	0	0	1	0	12
Aricidea wassi	0	0	0	1	0	0	0	0	0	0	0	4	0	5
Asabellides oculata	0	0	64	0	0	4	0	43	0	11	0	1	0	123
Asychis elongata	0	0	0	0	0	0	0	0	0	0	7	1	0	8
Batea catharinensis	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Bathyporeia porteri	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Bhwania goodei	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Bivalva	1	0	0	4	0	1	2	0	0	0	0	0	0	8
Branchiostoma caribaeum	0	1	0	4	2	0	12	0	0	0	1	3	6	29
Brania clavata	0	0	0	2	0	36	0	0	0	0	0	0	0	38
Brania sp.	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Brania wellfleetensis	0	0	0	0	0	3	0	0	0	0	0	1	0	4
Campylaspis sp.	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Capitomastus aciculatus	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Chiridotea tuftsi	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Cirolana concharum	4	0	0	0	0	0	0	0	0	0	0	0	0	4
Clymenella mucosa	0	0	0	0	0	4	0	0	0	0	0	0	0	4
Clymenella sp.	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Clymenella torquata	0	0	5	0	0	1	0	0	1	5	10	0	0	22
Corophium tuberculatum	0	0	0	0	0	0	0	0	0	7	0	0	0	7
Crangon septemspinosus	0	0	0	0	0	0	0	0	2	0	0	1	0	3
Cucumaria pulcherrima	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Decapod	0	0	0	0	0	0	0	0	0	0	7	0	3	10
Drilonereis magna	0	0	0	0	0	0	0	1	1	0	0	0	0	2
Ensis directus	0	0	0	0	0	0	0	138	5	0	6	0	0	149
Epitonium multistriatum	0	0	0	0	0	0	1	0	0	0	1	0	0	2
Euclymene zonalis	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Exogone dispar	0	0	0	13	0	1	0	0	0	0	0	0	0	14
Flat worm	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Gastropod	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Glycera americana	0	0	1	1	0	5	0	0	0	1	1	0	0	9
Glycera dibranchiata	1	0	0	0	0	0	3	0	0	0	0	1	0	5
Glycera robustus	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Haminoea solitaria	0	0	0	0	1	0	0	0	0	0	1	1	0	3

Table .		Continued.

Taxa	Station Date	336 Jun	336 Nov	342 Jun	347 Jun	347 Nov	353 Jun	353 Nov	361 Jun	361 Nov	372 Jun	372 Nov	377 Jun	396 Nov	Total
Harmathoe nodosa		0	0	0	0	0	0	0	0	0	1	0	0	0	1
Harmathoe sp.		0	0	0	0	0	1	0	1	0	0	0	0	0	2
Hemichordate		0	0	0	0	0	1	0	0	0	0	0	0	0	1
Heterotanais sp.		1	0	0	43	0	0	0	0	0	0	0	0	0	44
Isopod		0	0	0	0	0	0	0	0	0	0	0	0	3	3
Lepidactylus dytiscus		0	0	0	0	2	0	2	0	0	0	0	0	0	4
Leucon americanus		0	0	0	1	0	0	0	0	0	0	0	0	0	1
Lumbrinereis acuta		1	0	1	0	0	0	0	0	0	2	0	1	0	5
Lumbrinereis tenuis		0	0	0	0	0	2	9	0	1	0	0	0	0	12
Lyonsia hyalina		0	0	0	0	0	1	0	0	0	0	0	0	0	1
Macoma sp.		0	0	0	1	0	0	0	0	0	0	0	0	0	1
Macoma tenta		0	0	0	0	0	0	2	0	0	0	0	0	0	2
Magelona rosea		0	65	0	4	28	0	0	1	1	0	14	14	14	141
Maldanopsis elongata		0	0	6	0	0	0	0	0	0	7	0	0	0	13
Mangelia cerira		0	0	0	0	3	0	0	0	0	0	6	0	0	9
Mediomastus ambiseta		0	0	2	0	0	0	0	3	0	0	0	0	0	5
Mediomastus sp.		0	0	0	0	0	0	0	0	0	0	1	0	0	1
Mellita quinquiesperforata		0	1	0	15	1	24	0	0	0	3	0	102	1	147
Nassarius trivitattus		0	0	4	0	5	0	0	0	5	0	11	0	1	26
Nemertean		0	2	0	2	1	5	5	0	0	3	1	0	0	19
Nephtys bucera		2	0	0	0	2	0	1	0	0	0	0	0	1	6
Nephtys cryptomma		0	1	7	2	0	1	0	31	0	5	0	8	1	56
Nephtys incisa		0	0	0	0	0	0	0	0	1	0	0	0	0	1
Nephtys picta		0	0	2	1	0	0	0	1	9	5	1	15	2	36
Notomastus hemipodus		0	0	1	0	0	0	0	0	0	1	0	0	0	2
Notomastus latericeus		0	0	0	0	0	3	0	0	0	0	0	0	0	3
Notomastus sp.		0	0	0	0	0	0	0	0	0	0	0	1	0	1
Orbinia ornata		0	0	0	0	0	0	0	0	0	0	0	1	0	1
Owenia fusiformis		0	0	0	0	0	0	0	0	1	0	0	0	0	1
Oxyurostylis smithi		0	0	0	3	0	8	0	1	0	0	0	0	0	12
Pagurus longicarpus		0	0	0	2	1	2	1	0	3	0	9	3	0	21
Paleanotus heteroseta		0	0	0	0	0	2	11	0	0	0	2	0	0	15
Pandora trilineata		0	0	0	2	0	0	0	0	0	0	5	0	1	8
Panopeus herbstii		0	0	0	0	0	0	2	0	0	0	0	0	0	2
Paraonis fulgeus		0	0	0	0	0	0	0	0	0	0	0	2	0	2
Paraphoxus spinosus		0	0	0	0	0	0	0	0	0	0	0	2	0	2
Parapionosyllis manca		0	0	0	0	0	1	0	0	0	0	0	0	0	1
Phoronis spp.		0	0	1	0	0	0	0	9	0	0	7	0	0	17
Phyllodoce arenae		0	0	0	0	0	0	0	2	0	0	0	0	0	2
Phyllodoce mucosa		0	0	0	0	0	0	0	1	0	0	0	0	0	1
Pinixia cylindrica		0	0	0	0	0	3	0	0	0	0	0	0	0	3
Pinixia retinens		0	0	1	0	0	0	0	0	0	0	0	0	0	1
Pista palmata		0	0	0	0	0	1	0	0	0	0	2	0	0	3
Podarke obseura		0	0	0	0	0	0	1	0	0	0	0	0	0	1
Polinices duplicatus		0	0	0	1	0	0	0	0	0	0	0	0	0	1
Polydora ligni		0	0	12	0	0	3	0	7	0	3	0	0	0	25
Pontocrates sp.		0	0	0	2	0	0	0	0	0	0	0	0	0	2

Table . Continued.

Taxa	Station Date	336 Jun	336 Nov	342 Jun	347 Jun	347 Nov	353 Jun	353 Nov	361 Jun	361 Nov	372 Jun	372 Nov	377 Jun	396 Nov	Total
Prionospio malmgreni		0	0	45	0	0	0	0	50	3	50	9	0	1	158
Protodorvillea egena		0	0	0	0	0	3	11	0	0	0	0	0	0	14
Protohaustorius wigleyi		0	0	0	19	0	0	0	0	0	0	0	11	7	37
Pseudeurythoe paucibranchiata		0	0	0	0	0	1	0	0	0	0	0	0	0	1
Ptilanthura tenuis		0	0	0	0	0	0	0	0	1	0	0	0	0	1
Pyramidella candida		0	0	0	0	0	0	0	0	0	0	1	0	0	1
Scolelepis squamata		0	11	0	0	0	0	0	0	0	0	0	0	0	11
Sigalion arenicolae		0	0	0	0	0	0	0	0	0	0	0	0	1	1
Sigambra tentaculata		0	0	0	0	0	0	0	1	0	0	0	0	0	1
Spio setosa		0	0	1	0	0	6	0	3	0	0	0	0	0	10
Spiochaetopterus oculatus		0	0	1	1	0	0	0	0	0	0	3	0	0	5
Spiophanes bombyx		0	0	17	1	1	1	3	5	8	9	36	1	4	86
Spisula solidissima		1	0	0	0	0	0	0	0	0	0	0	0	0	1
Stauronereis rudolphi		0	0	0	0	0	1	0	0	0	0	0	0	0	1
Sthenelais limicola		0	0	0	0	0	0	0	0	1	0	0	0	0	1
Stylochus sp.		0	0	0	0	0	0	0	3	0	0	0	0	0	3
Synchelidium americanum		0	0	0	4	0	1	0	0	0	0	0	3	0	8
Tectonatica pusilla		0	0	0	0	0	0	0	0	0	0	1	0	0	1
Tellina agilis		1	0	0	0	0	0	0	0	0	0	7	5	0	13
Tharyx setigera		0	0	0	5	0	0	0	0	0	0	0	4	0	9
Trichophoxus epistomus		0	0	0	0	0	0	0	0	0	0	0	0	1	1
Tubificidae		0	0	0	0	0	33	0	0	0	0	0	4	0	37
Turbonilla interupta		0	0	0	0	5	0	0	0	7	0	6	0	0	18
Unciola irrorata		3	0	4	24	0	0	1	3	1	0	3	0	23	62
Grand Total		19	86	196	169	53	170	70	346	123	135	218	195	73	

Table 13. Top ranked taxa, in terms of both occurrence and abundance from 13 of the Smith-MacIntyre grabs processed from 1996. Occur. is total occurrences out of 13 grabs and Abund. is summed abundance from the 13 grabs.

Taxa	Major Taxon	Occur.	Abund.
Spiophanes bombyx	Pl*	11	86
Magelona rosea	Pl	8	141
Unciola irrorata	Am	8	62
Nephtys cryptomma	Pl	8	56
Nephtys picta	Pl	8	36
Mellita quinquiesperforata	Ec	7	147
Aglaophamus verrilli	Pl	7	139
Branchiostoma caribaeum	Ch	7	29
Pagurus longicarpus	De	7	21
Nemertean	Ne	7	19
Prionospio malmgreni	Pl	6	158
Asabellides oculata	Pl	5	123
Ensis directus	Bv	3	149
Heterotanais sp.	Ta	2	44

*	Pl	Polychaete
	Am	Amphipod
	Ec	Echnioderm
	Ch	Chordate
	De	Decapod
	Ne	Nemertean
	Bv	Bivalve
	Ta	Tanaid

Table 14. Summary of the number of species per major taxon. Data from the Norfolk Disposal Site, NDS, are from Dauer (1981) and represent total number of species from approximately 4.8 m^2 of bottom. The VA-B data are from the 13 grabs processed for species and represent totals for 1.3 m^2 of bottom.

Taxonomic Group	Number of Species VA-B	NDS
Polychaetes	55	81
Amphipods	13	24
Bivalves	8	14
Gastropods	9	14
Cumaceans	3	5
Decapods	4	4
Isopods	3	3
Oligochaetes	3	2
Echinoderms	1	2
Other	8	6

Table 15. Percent of small and large wet weight biomass (Wt Wt %) and total individuals (No. %) summarized by major taxonomic group, from June and November 1996 Smith-MacIntyre grab data. The small category is the sum of 0.5, 1.0 and 2.0 mm sieve fractions. The large category is the sum of 3.35 and 6.3 mm sieve fractions.

Major Taxa	Date	Wt Wt % Small	Wt Wt % Large	No. % Small	No. % Large
Echnioderms	June	0.02	0.98	0.40	0.60
Sand Dollars	June	0.04	0.96	0.99	0.01
Crustaceans	June	0.04	0.96	0.63	0.37
Bivalves	June	0.09	0.91	0.50	0.50
Gastropods	June	0.10	0.90	0.69	0.31
Chordates	June	0.18	0.82	0.46	0.54
Annelids	June	0.30	0.70	0.76	0.24
Misc.	June	0.32	0.68	0.57	0.43
Anemones	June	0.66	0.34	0.80	0.20
Amphiods	June	0.81	0.19	0.97	0.03
All Taxa	June	0.17	0.83	0.86	0.14
Echnioderms	November	0.00	1.00	0.00	1.00
Sand Dollars	November	0.01	0.99	0.71	0.29
Bivalves	November	0.03	0.97	0.38	0.63
Gastropods	November	0.04	0.96	0.70	0.30
Crustaceans	November	0.09	0.91	0.85	0.15
Chordates	November	0.27	0.73	0.46	0.54
Misc.	November	0.28	0.72	0.81	0.19
Annelids	November	0.42	0.58	0.79	0.21
Anemones	November	0.72	0.28	0.83	0.17
Amphiods	November	0.87	0.13	0.97	0.03
All Taxa	November	0.20	0.80	0.84	0.16
Totals	June+Nov	0.19	0.81	0.85	0.15

Table 16. Size class distribution of biomass (g wet wt) and individuals by major taxonomic groupings for June and November 1996 grab data.

	Seive Size (mm)	June Sum of 42 grabs No.	Wet Wt	% No	% wt	November Sum of 39 grabs No.	Wet Wet	% No	% Wt	June Average per garb ($0.1\ m^2$) No.	Wet Wt	November No.	Wet Wt
Amphiods	0.5	413	0.092	0.30	0.03	393	0.143	0.28	0.05	9.83	0.00	10.08	0.00
	1	819	0.917	0.59	0.31	685	0.976	0.48	0.31	19.50	0.02	17.56	0.03
	2	111	1.394	0.08	0.47	299	1.589	0.21	0.51	2.64	0.03	7.67	0.04
	3.35	42	0.520	0.03	0.18	41	0.411	0.03	0.13	1.00	0.01	1.05	0.01
	6.3	2	0.033	0.00	0.01	0	0.000	0.00	0.00	0.05	0.00	0.00	0.00
	Totals	1387	2.956			1418	3.119			33.02	0.07	36.36	0.08
Annelids	0.5	997	0.716	0.25	0.01	826	20.157	0.23	0.18	23.74	0.02	21.18	0.52
	1	1134	2.843	0.28	0.05	1241	7.910	0.35	0.07	27.00	0.07	31.82	0.20
	2	924	12.970	0.23	0.23	740	17.404	0.21	0.16	22.00	0.31	18.97	0.45
	3.35	916	29.641	0.23	0.53	559	33.032	0.16	0.30	21.81	0.71	14.33	0.85
	6.3	66	9.276	0.02	0.17	196	30.774	0.06	0.28	1.57	0.22	5.03	0.79
	Totals	4037	55.446			3562	109.277			96.12	1.32	91.33	2.80
Anemones	0.5	0	0.000	0.00	0.00	0	0.000	0.00	0.00	0.00	0.00	0.00	0.00
	1	0	0.000	0.00	0.00	2	0.011	0.17	0.09	0.00	0.00	0.05	0.00
	2	12	0.129	0.80	0.66	8	0.081	0.67	0.64	0.29	0.00	0.21	0.00
	3.35	3	0.066	0.20	0.34	2	0.035	0.17	0.28	0.07	0.00	0.05	0.00
	6.3	0	0.000	0.00	0.00	0	0.000	0.00	0.00	0.00	0.00	0.00	0.00
	Totals	15	0.195			12	0.127			0.36	0.00	0.31	0.00
Bivalves	0.5	32	0.022	0.09	0.00	4	0.004	0.02	0.00	0.76	0.00	0.10	0.00
	1	44	0.166	0.13	0.01	26	0.067	0.14	0.00	1.05	0.00	0.67	0.00
	2	93	2.701	0.27	0.08	39	1.864	0.21	0.03	2.21	0.06	1.00	0.05
	3.35	150	8.832	0.44	0.27	24	2.426	0.13	0.04	3.57	0.21	0.62	0.06
	6.3	22	20.853	0.06	0.64	91	56.762	0.49	0.93	0.52	0.50	2.33	1.46
	Totals	341	32.574			184	61.123			8.12	0.78	4.72	1.57

Table 16. Continued.

	Seive Size (mm)	June Sum of 42 grabs No.	Wet Wt	% No	% wt	November Sum of 39 grabs No.	Wet Wet	% No	% Wt	June Average per garb (0.1 m^2) No.	Wet Wt	November No.	Wet Wt
Chordates	0.5	0	0.000	0.00	0.00	0	0.000	0.00	0.00	0.00	0.00	0.00	0.00
	1	4	0.035	0.05	0.01	6	0.090	0.05	0.02	0.10	0.00	0.15	0.00
	2	35	0.387	0.41	0.16	51	1.324	0.41	0.26	0.83	0.01	1.31	0.03
	3.35	33	0.691	0.39	0.29	43	2.302	0.35	0.44	0.79	0.02	1.10	0.06
	6.3	13	1.250	0.15	0.53	24	1.459	0.19	0.28	0.31	0.03	0.62	0.04
	Totals	85	2.363			124	5.175			2.02	0.06	3.18	0.13
Crustaceans	0.5	35	0.015	0.19	0.00	131	0.031	0.29	0.00	0.83	0.00	3.36	0.00
	1	45	0.063	0.25	0.01	173	0.238	0.39	0.03	1.07	0.00	4.44	0.01
	2	34	0.183	0.19	0.03	76	0.498	0.17	0.06	0.81	0.00	1.95	0.01
	3.35	44	1.706	0.24	0.26	46	2.154	0.10	0.26	1.05	0.04	1.18	0.06
	6.3	22	4.708	0.12	0.71	22	5.423	0.05	0.65	0.52	0.11	0.56	0.14
	Totals	180	6.675			448	8.344			4.29	0.16	11.49	0.21
Echnioderms	0.5	1	0.001	0.20	0.00	0	0.000	0.00	0.00	0.02	0.00	0.00	0.00
	1	1	0.006	0.20	0.02	0	0.000	0.00	0.00	0.02	0.00	0.00	0.00
	2	0	0.000	0.00	0.00	0	0.000	0.00	0.00	0.00	0.00	0.00	0.00
	3.35	2	0.051	0.40	0.16	3	0.227	0.60	0.26	0.05	0.00	0.08	0.01
	6.3	1	0.256	0.20	0.82	2	0.645	0.40	0.74	0.02	0.01	0.05	0.02
	Totals	5	0.314			5	0.872			0.12	0.01	0.13	0.02
Gastropods	0.5	11	0.018	0.06	0.00	18	0.071	0.06	0.00	0.26	0.00	0.46	0.00
	1	76	0.305	0.44	0.03	76	0.743	0.25	0.01	1.81	0.01	1.95	0.02
	2	32	0.635	0.19	0.06	120	2.924	0.39	0.03	0.76	0.02	3.08	0.07
	3.35	47	6.513	0.27	0.66	52	4.712	0.17	0.06	1.12	0.16	1.33	0.12
	6.3	6	2.450	0.03	0.25	38	75.698	0.13	0.90	0.14	0.06	0.97	1.94
	Totals	172	9.921			304	84.148			4.10	0.24	7.79	2.16

Table 16. Continued.

	Seive Size (mm)	June Sum of 42 grabs No.	June Sum of 42 grabs Wet Wt	% No	% wt	November Sum of 39 grabs No.	November Sum of 39 grabs Wet Wet	% No	% Wt	June Average per garb (0.1 m^2) No.	June Average per garb (0.1 m^2) Wet Wt	November Average per garb (0.1 m^2) No.	November Average per garb (0.1 m^2) Wet Wt
Misc.	0.5	1	0.001	0.14	0.01	26	0.060	0.28	0.03	0.02	0.00	0.67	0.00
	1	1	0.018	0.14	0.17	14	0.110	0.15	0.06	0.02	0.00	0.36	0.00
	2	2	0.016	0.29	0.15	35	0.359	0.38	0.19	0.05	0.00	0.90	0.01
	3.35	3	0.074	0.43	0.68	12	0.953	0.13	0.51	0.07	0.00	0.31	0.02
	6.3	0	0.000	0.00	0.00	6	0.405	0.06	0.21	0.00	0.00	0.15	0.01
	Totals	7	0.109			93	1.887			0.17	0.00	2.38	0.05
Sand Doll.	0.5	406	0.135	0.17	0.00	0	0.000	0.00	0.00	9.67	0.00	0.00	0.00
	1	1905	2.250	0.79	0.03	10	0.019	0.10	0.00	45.36	0.05	0.26	0.00
	2	94	0.307	0.04	0.00	58	0.458	0.60	0.01	2.24	0.01	1.49	0.01
	3.35	10	0.187	0.00	0.00	10	0.280	0.10	0.01	0.24	0.00	0.26	0.01
	6.3	9	61.570	0.00	0.96	18	32.245	0.19	0.98	0.21	1.47	0.46	0.83
	Totals	2424	64.449			96	33.002			57.71	1.53	2.46	0.85
Totals	0.5	2274	1.077	0.23	0.01	1660	20.578	0.23	0.07	54.14	0.03	42.56	0.53
	1	4803	7.457	0.49	0.04	2745	10.902	0.38	0.04	114.36	0.18	70.38	0.28
	2	1414	19.933	0.14	0.12	1649	27.592	0.23	0.09	33.67	0.47	42.28	0.71
	3.35	1248	47.095	0.13	0.27	787	44.789	0.11	0.15	29.71	1.12	20.18	1.15
	6.3	121	95.721	0.01	0.56	375	197.988	0.05	0.66	2.88	2.28	9.62	5.08
	Totals	9860	171.283			7216	301.849			234.76	4.08	185.03	7.74
June+Nov	0.5	3934	21.655	0.23	0.05	48.57	0.27						
	1	7548	18.359	0.44	0.04	93.19	0.23						
	2	3063	47.525	0.18	0.10	37.81	0.59						
	3.35	2035	91.884	0.12	0.19	25.12	1.13						
	6.3	496	293.709	0.03	0.62	6.12	3.63						
	TOTAL	17076	473.132			210.81	5.84						

The Department of the Interior

As the Nations's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources, protecting our fish, wildlife, and biological diversity, preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nations's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the Offshore Minerals Management Program administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS Royalty Management Program meets its responsibilities by entrusting the efficient, timely and accurate collection and distribution of revenue from mineral leasing and production due to Indian tribes andallottees, States and the U. S. Treasury

the MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialog with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.